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Harmony and Stability:
Number and Proportion in Early Greek Conceptions of Nature

by

Heidi Marguerite Northwood ©

A thesis submitted to the Faculty of Graduate Studies and
Research in partial fulfillment of the requirements for the
degree of Doctor of Philosophy

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled *Harmony and Stability: Number and Proportion in Early Greek Conceptions of Nature* submitted by Heidi Marguerite Northwood in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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Abstract

The ancient Greeks were obsessed with the stability of various parts of their world: the ultimate stability of the cosmos, the stability of virtue and the stability of health. They postulated a number of mechanisms which where meant to explain how stability was to be achieved or maintained at the various levels of the cosmos. One such explanatory mechanism was that the underlying structure of phenomena--the proportionate blending or regulation of their parts--accounted for their dynamic or static equilibrium.

In this thesis two different kinds of proportion that were common in ancient explanations of phenomena are examined: isonomic proportion and harmonic proportion. Isonomic proportion (1:1), which was most commonly used in theories which made use of physical opposites, described and helped maintain the stability between opposites of equal strength or quantity.

Harmonic or musical proportion (2:1, 3:2, 4:3), was used primarily in theories which made use of opposites that were not equal to one another (either with regard to either their ethical or ontological status). The opposites in this sort of union were brought together in such a way that one in the pair was preponderant, or one was clearly conceived as the ruler over the other(s). In such a relationship, there was no obvious mechanism internal to the harmonic structure that could account for the desired stability.

It is argued that the Greeks relied on the belief of the inherent stability of number to account for the stability of harmonic structures. After background analyses of both the types of opposites employed in Greek natural philosophy as well as how value was connected to polarity, and the importance and influence of Pythagorean conceptions of number and musical proportion, there is an in depth consideration of the use of both isonomic and harmonic ratios in Greek theories of the body, the soul and the cosmos. In the final section the question of stability is directly treated. There both dynamic and static unions, the supposed inherent stability of numerical ratios, and the Greeks' use of analogy and presupposition to account for and safeguard the stability of their world are considered.

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I would also like to thank John Thorp who introduced me to the topic of ancient Greek music. As he knows, his views on Aristotle's theory of perception as well as his general approach to ancient Greek philosophy have greatly influenced me. What is more, his (hmhm) anonymous comments on my work on ancient Greek music over the past 5 years have been very helpful.

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Chapter 1

Introduction: The Problem of *Harmonia*

> [If] our aim is to regain the standpoint of ancient speculation, we cannot afford to discard all elements foreign to our own ways of thinking; any more than the historian of religion can afford to dismiss as 'superstitious fancies' beliefs and practices which the civilised world has outgrown. Rather we should fix attention on these strange features and try to recover the attitude of mind that will account for them.[1]

There are many strange, alien and odd passages in ancient Greek texts. Sometimes these passages contain a surprising metaphor, at other times a seemingly absurd explanation; even awkward wording can place a great distance between us and the text. The strangeness of these passages can make us uncomfortable. We have been taught that ancient Greek culture is the root of our own, albeit more advanced, society, that the classical Greeks laid the foundations of Western civilization. It can be very difficult for us to want to see the alienness of some of our own intellectual ancestry. Sometimes we console ourselves with the thought that the odd passages that are so prevalent in the ancient texts cannot be very important.

Yet the unfamiliarity of much of Greek thinking engenders the indisputable fact that Greek society was very different from our own. That Greek culture is different from that of late 20th century Western society may seem obvious. After all, to live in a society that was underscored by polytheism and was rampant with superstition, where women were often viewed as the nemesis of men, and where war and plague were facts of life, would entail having experiences very different from our own. Nevertheless, these differences (and the alien passages) are neglected or underemphasized by historians and philosophers. There are many possible causes of this neglect.

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[1] F.M. Cornford, "Was the Ionian Philosophy Scientific?" in *Greek and Roman Philosophy: A 52 Volume Reprint Set*, Vol. 10 *The Selected Papers of F.M. Cornford* (ed. A. Bowen), New York (1987): p. 191.

It can be very tempting to consciously ignore the odd passages; if we are trying to make sense of a text as a whole, a few sentences ignored won't matter too much. Or will they? The kind of reading that one gives an ancient text determines the scope of ultimate understanding. If one is merely scanning a text for references to a particular idea or word, then one probably should pass over the passages that don't make sense, if for no other reason than that one's time is short. But if one wants to probe the text more deeply in order to determine the meaning or structure of the work as a whole, then one would do better to figure out what the strange passages mean.

But even the recognition that a passage is alien can be a very difficult task, and this brings us to a second cause of the neglect. More often than not, our 20th century eyes sift out these strange passages. We have been taught to be charitable; to give people and works the benefit of doubt; to attribute sense to them (our sort of 'sense') even when sense might not be present. We tend to see radically different scientific frameworks in light of our own scientific theories, presuppositions, standards of rationality and associative connections, and interpret them thus. Therefore, it is not just a matter of deciding to examine in detail every odd passage that one comes across. One must guard oneself against those perceptual and mental blocks that screen out the knowledge that these passages are weird in the first place.

Thus, it is vital to be as aware as possible of what modern presuppositions one is 'taking into the project'. This too is extremely difficult. There are, however, a few clearly naive, yet entrenched, biases or modern presuppositions that have been shown to be present in previous historical studies of which one can be wary. The most naive of these is the 'Whiggish', monotonic notion that science has progressed from older faulty theories to current ones which reflect a higher degree of accuracy or truth. Behind this 'Whiggish' notion of progress are two further presuppositions. The first is that there is a set of problems to be solved by science, and that ancient science is a progressive coming to grips with these problems; progress in science is achieved when there is the recognition that these are the problems to be solved by science or when an attempt (successful or otherwise) is made to answer one or more of these questions. The second presupposition implicit in this 'Whiggish' approach is that there is a canonical set of phenomena that observation progressively reveals.

This 'Whiggish' approach to the history of science is often behind attempts to find the seeds of later scientific theories in those of the ancient Greeks', the motivating idea being something like the following. If science is made up of a core set of problems and phenomena, then what is interesting about Greek science, what is fruitful in historical analyses of ancient scientific theories, is the discovery of where the Greeks got it right.

One problem with this sort of approach is the consequence that ancient ideas and/or 'discoveries' are inevitably seen in isolation from their theoretical and cultural context. While sometimes it is productive to view an idea or theory in such an isolated manner, when one's goal is to understand and evaluate an idea, surely the broader context is necessary.

Moreover, by marking off and concentrating on those aspects of ancient Greek science that most resemble our own, the similarities between ancient and modern science are unduly exaggerated. If, for example, one defines science as the use and formulation of methods based on observation and experiment, and one looks to ancient science for the use of this method, one will inevitably find it, and conclude that ancient science wasn't all that different from our own. But at what cost? As Ludwig Edelstein wrote, "the impression that ancient science is modern in character is bought as the price of neglecting or omitting all the evidence to the contrary".[2] Those aspects of ancient science that do not fall under our definition of science--that are now thought to be false or absurd--are relegated to the category of 'non-scientific', and may be viewed as intrusions from religion, magic, politics, etc. that interrupted the progression of science.[3]

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[2] See page 405 in Ludwig Edelstein's "Recent Trends in the Interpretation of Ancient Science" in *Ancient Medicine* (eds. Owsei Temkin and C. Lilian Temkin) Baltimore (1967): 401-439.

[3] See for example, F.M. Cornford's article "Was the Ionian Philosophy Scientific?". Although realizing that one must not ignore or dismiss those areas of ancient science that seem strange to us, Cornford continues by writing that it is only in the sphere of Hippocratic medicine that one finds the first steps towards inductive science, that medicine was the "only art known in antiquity that was impelled to formulate a method based on observation and rudimentary experiment" (Cornford p. 194). Defining science as that discipline which uses empirical methods, Cornford believed that ancient science ultimately surrendered itself to the influence of the religious elements of ancient thought: "If Aristotle had followed his father's profession and never

The Greeks, however, did not view these 'non-scientific' elements of their science as "intrusions". Rather, "astrology, the theory of humors, Plato's mathematical scale of music" are just as scientific to the Greek natural philosopher "as those other views which happen to seem acceptable to the modern scientist" (Edelstein, p. 405). As Ludwig Edelstein so eloquently wrote,

> The historian...must try to understand that that which is ridiculous and false in the past is inseparably connected with that which is praiseworthy and true. The errors of the Greeks should teach him as much about their science as do their correct results. What appears to be so "modern" acquires its specific hue only if placed against the setting of the "antiquated." (Edelstein, p. 405)

By looking for precursors of modern ideas in ancient science, one will not only unjustifiably magnify the similarities between ancient and modern science, but one will also be forced to create a category of the 'non-scientific'. In making such a distinction, one is creating two categories where the Greeks had only one; the Greeks considered parts of what we consider to be scientific and these 'non-scientific' intrusions as components of the same

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joined the Academy, who can say how far he might have carried the empirical impulse of medicine into the whole field of natural philosophy? But he succumbed to the influence of the divine Plato; and no sooner were he and his master dead than they became authorities, whose intuitions rendered the study of brute fact superfluous. Thence onwards and all through the Middle Ages, the philosophers ranked once more beside the prophet, and the premises to which all knowledge must conform were furnished by the combined revelation of faith and reason. The empirical theory of knowledge has only raised its head again effectively in the last few centuries. It is a mistake to assume that it governed the speculations of ancient Ionia" (Cornford, p. 197).

endeavour, the attempt to understand the physical world. Thus, Edelstein believes, and I agree, that one should not underemphasize the differences in approach between ancient and modern science, and assume that those aspects of ancient thought that are alien to our own scientific methodology are non-scientific. The attempt to find seeds of later scientific theories in the ancient Greeks' theories, although fruitful perhaps for some sorts of endeavours, is not appropriate if one wishes to understand ancient science.

There are, in addition, two further, related, presuppositions against which one must guard oneself. The first is a static, decontextualized conception of rationality. The second is the view that since all theories of science are in the end trying to describe the same phenomena, different theories may be judged as more or less correct depending on how accurately they explain the phenomena. If one is committed to these presuppositions, then one would be likely to view strange ideas in ancient science as merely evidence that one is dealing with an irrational scientist who got it all wrong. Then, if one chooses to study ancient scientific theories at all, one must justify one's project by showing how the study of something that is 'incorrect' and 'irrational' is still valuable in some way.

If, however, one calls into question the validity of these presuppositions--if one adopts a diachronic, rather than a timeless view of rationality or what counts as 'good reason', and if one recognizes that the problems and phenomena that scientific theories attempt to explain can also change through time--then one is in a better position to recognize those aspects of a theory that are alien to our own way of thinking, and to begin to understand why the Greeks thought a particular explanation was better than its rival.

What constitutes 'good reason' for holding a certain view in ancient speculation may not be the same as our own 'good reason'. As Michael Frede has written, it is sometimes necessary to go beyond the philosophical and venture into the historical/cultural arena in order to understand why the ancients considered a particular explanation to be adequate.[4] It may have been the case that a religious or traditional presupposition, or cultural norm, was believed to be relevant in an explanation of a particular phenomenon. Because we no longer recognize the relevance of these ancient religious or cultural presuppositions, we may think that an explanation supported by these presuppositions is materially fallacious and the connection not adequately justified. Having 'good reason' for a belief, however, is not about *what* one believes, but about how one came to have those beliefs, and how one comes to believe new things on the basis of older beliefs. These conditions will change over time, as what is relevant in explanation will change depending on the cultural and scientific context.

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[4] See pp xi-xiv of Michael Frede's "Introduction: The Study of Ancient Philosophy" in his *Essays in Ancient Philosophy*, Minneapolis (1987): ix-xxvii. I quote the following as it shows the difficulty of understanding what constitutes 'good reason' for the Greeks: "It is, of course, quite true, that the agent in question may have a different view of what constitutes a good reason and may act on what he considers to be good reasons. But in this case his behavior would not be readily and immediately intelligible to us, precisely because we would first have to realize that he acted on a different conception of what constitutes a good reason, and then we would have to understand why he had this different conception. In the end we have no alternative but to understand what others did or thought in terms of our notion of what constitutes a good reason, though in trying to understand others we may come to realize that it is our own notion of what counts as a good

I do not, however, believe that rationality or 'good reason' is entirely culturally dependent. What needs to be distinguished is rationality, and relevancy conditions. It is the soundness of the premises, rather than the validity of arguments, that can change through time. For example, it may be the case that I disagree with the conclusion of an argument that a particular Greek upheld, but at this point, I would want to ask myself whether it is the argument itself which is fallacious, or whether it is one of the premises

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reason that needs to be changed and that stand in the way of understanding them" (xi).

that I do not accept. If the latter is the case, then I might want to further investigate the reasons why the particular author thought that he had good reason for holding such a belief. It is at this point that I might want to look beyond the philosophical to the wider cultural context for a possible explanation as to why the author believed what he did; it is here that the historian must remember that what was relevant in justifying such beliefs might be different then from what it is now.

Thus, to some degree, assessing the rationality of ancient authors is beside the point of what the historian is trying to do. The historian can only work with the normative conception of rationality that he or she possesses, since to go beyond this conception is impossible. Yet the historian can widen his or her understanding of what is relevant to a particular argument or explanation. It is this 'widening' that is sometimes necessary in order to fully understand what constituted 'good reason' for a Greek author.

It is also the case that, depending on the underlying historical and theoretical presuppositions, which phenomena are theoretically troublesome changes through time. For example, in *De Caelo*, Aristotle assigns to each of the elements of the universe a natural motion which impels it to its natural place. The natural place of earth is at the centre of the universe which is 'down', and the natural place of fire is at the edge of the universe which is 'up'. Earth and fire will each go to their respective natural places unless they are impeded by some other object. Because of this theoretical system, horizontal motion of the sublunary elements required elaborate explanation.

Furthermore, it is not only the case that the theoretically troublesome 'brute facts' are different in different contexts, but also what are recognized to be 'brute facts' are different in different historical and scientific settings. Even a cursory reading of an ancient text will reveal explanations of phenomena that we do not recognize as phenomena--for example, Aristotle's explanation of why mirrors are stained red by the eyes of menstruating women.[5] Furthermore, Aristotle took it as a 'brute fact' that eternal things were axiologically superior to things that are generated and perish.[6] It is difficult to understand how the phenomena can change--how the facts of the world may be different in different contexts--but the beginnings of an understanding may come from the realization that what we recognize as facts to a large degree is dependent on our theories of the world, on the 'non-scientific' presuppositions that we have, and on what has been traditionally believed to be the case.

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[5] See Aristotle *On Dreams* 459b24-460a32.

[6] See *De Caelo* I.ii and iii.

By recognizing that what constitutes 'good reason' can change through time, one can see the folly behind using a static, decontextualized conception of rationality in one's assessment of good theory and explanation in the ancient world. Moreover, that the theoretically troublesome phenomena as well as the 'brute facts' change in time calls into question the validity of judging different theories as more or less correct depending on how accurately they explain the phenomena; every theory in science is not trying to explain the same phenomena.

Thus, by recognizing and being wary of these modern presuppositions, one is in a better position to attempt a reconstruction of the methodology, general theory and/or underlying presuppositions in a particular area of ancient natural philosophy; one can achieve a better understanding of a particular ancient theory in its own epistemological context, and thus give the theory a fairer evaluation.

As difficult as this sort of enterprise is, it can have great rewards. More often than not (i.e. when the passage is strange for reasons other than textual corruption) one ends up discovering embedded ideas or presuppositions that may cast light not only on the text, but, more generally, on Greek cultural beliefs or dispositions to certain kinds of beliefs. Sometimes one finds that a strange passage will point to a concealed ancient explanation of a phenomenon--an explanation that is no longer held to be correct or valid, and a phenomenon that we do not recognize.

An example of this is found in Aristotle's theory of perception. In *De Anima*, Aristotle wrote that perception is a "qualitative alteration" (II 4, 415b24) or a "change of quality" (II 5, 416b35); in order to perceive, at one point "what acts and what is acted upon are like, [at] another unlike, i.e. prior to and during the change the two factors are unlike, after it like" (II 5, 417a20); 'sense' or a sense organ is what has the power of taking on the sensible form of the object (II 12, 424a18-23). There are, in the main, two different sorts of interpretation of these and other similar passages. On the one hand, some scholars believe that this qualitative alteration is to be understood literally, i.e. the sense organ actually takes on the quality of the sense object, whereas other scholars understand this qualitative alteration as metaphorical.[7]

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[7] Proponents of the 'literalist interpretation' are Thomas J. Slakey and Richard Sorabji. See Slakey's "Aristotle on Sense

The literalist interpretation stays very close to the text, but must attribute to Aristotle the belief that the eye becomes red, the ear becomes noisy, the nose becomes stinky, etc. Opponents to this view base their arguments against it, for the most part, on the implausibility or absurdity of the idea that the eye becomes red when it is in its perceiving state, the ear becomes noisy, etc.

The literalist interpretation, in addition to staying close to the above cited passages, is also able to explain other strange passages in *De Anima*. For example, Aristotle wrote that "[it] is also a sign of whether we hear or not that the ear does or does not reverberate like a horn; the air inside the ear has always a movement of its own, but the sound we hear is always the sounding of something else, not of the organ itself" (II 8, 420a15). The literalist interpretation is able to explain this passage since the healthy ear is supposed to have a mean note, which although unperceptible to this healthy individual may, nonetheless, be perceptible to someone else. An unhealthy ear will not reverberate, since it can no longer echo. Opponents to the

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Perception", in *The Philosophical Review*, 70 (1961): 470-84, and Sorabji's "Body and Soul in Aristotle", in *Philosophy* 49 (1974): 63-89. D.W. Hamlyn, and Deborah Modrak both think that the literalist interpretation is absurd. See page 9 of Hamlyn's "Aristotle's Account of Aesthesis in the *De Anima*, *Classical Quarterly* 9 (1959-60): 6-16, and page 59 of Modrak's *Aristotle: The Power of Perception*, Chicago (1987).

literalist interpretation must scramble to find a plausible, consistent interpretation of this passage.

Here then, we find an example of an explanation that is no longer held to be correct, and a phenomenon that we do not recognize. What Aristotle's explanation points to is the possibility that he believed sensation to be the literal qualitative alteration of the sense organ. Not only does this interpretation follow the text of *De Anima*, but the only arguments against it are based on the misconception that what we now deem to be the phenomena were always deemed to be the phenomena.

Sometimes an idea or explanation found in a strange passage is repeatedly expressed. When this is the case, one can arrive at something even more interesting; the passages are more likely than not to point to a commonly held presupposition or principle of methodology. Such presuppositions are rarely expressed explicitly, yet can influence a wide range of beliefs and explanations. By getting at these presuppositions, one is better equipped to understand Greek science and philosophy.

One commonly repeated idea in ancient texts, both scientific and ethical, is the belief that it is appropriate and useful to employ both music theory and musical terminology in fields that have nothing to do with music. For instance, Plato saw a similarity between the relations that planets have to one another and the relations between notes in a scale; he compared justice to a harmony and filled pages refuting the idea that the soul is a harmony. Aristotle in *De Sensu* wrote that we find red and purple pleasing because their ratios are the same as those of the musical concords. In the *Nicomachean Ethics* his theory of virtue makes use of the doctrine of the mean which exhibits a similar structure to the musical scale in so far as there are mean notes in a scale that lie in between two opposites. In the Hippocratic Corpus, health is conceived as a balance or harmonization of food and exercise, and in *Regimen* I.viii, parts of the embryo come together successfully, again, only if in the proper ratios--those that correspond to the musical concords. Opposites in Greek medicine and physics were regularly joined by means of a third harmonizing principle which, in at least some contexts, was analogous to the harmonizing principle that joined the opposites in music, the high (*oxus*) and the low (*barus*).

At first glance, these ideas, at best, seem odd. Why would the Greeks have thought it appropriate to describe certain parts of astronomy, medicine, ethics and physics by means of ideas and terminology originally from music?--for their use of music goes beyond the metaphorical use of words like *harmonia;* quite often the ontological structures underlying scientific theories are based upon the theoretical structure of the octave.[8]

The Greeks' use of music theory in other disciplines becomes less surprising when one examines the context of these beliefs. What one must understand, in part, is the interconnectedness between the ideas of polarity, number and *harmonia* in ancient thought. When one does so, one sees that music theory, or more specifically the idea of *harmonia*, offers a very fitting solution to an earlier problem in ancient science, and that its use in ancient thought is very natural.

The chapters that follow, to a large degree, contain the story of how these concepts are related. Number or ratio was introduced into science for a number of reasons, one of which was that it introduced orderliness and fixity into a world filled with chaotic forces and opposites battling with one another. These opposites, found in Greek thought all the way back into mythology, were used by some of the Presocratic writers as a means to explain change, motion and generation in the physical world. The warring of opposites, however could not, by itself explain the perceived regularities in nature. For example, night is always succeeded by day, and likewise, night takes over from day, in an endless succession. The Greeks recognized this, and postulated a third principle (or entity) above and ontologically different from the warring opposites. Sometimes this principle was personified and took the guise of a judge or time, as is the case in Anaximander. Other authors, for instance Heraclitus, use the idea of god, a divine logos, or harmony as this principle. These principles fit the two opposites together in a way that not only allowed the opposites to continue their distinctiveness and their mutual antagonism, but also brought them together in a way that safeguarded their respective rules in the physical world, yet in an orderly and measured manner.

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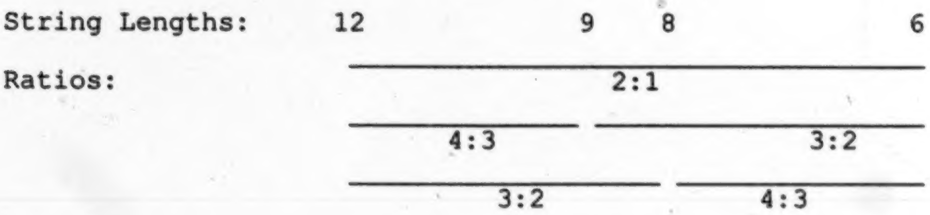
[8] For example, Plato's *Timaeus* 35b-36b, and the Hippocratic work *Regimen* I.viii.

Furthermore, the elements that made up animate and inanimate objects in the cosmos were viewed as opposed to each other either with respect to their powers or qualities. These opposites were thought to be blended or mixed to form a relatively stable union by means of a third ontologically distinct principle that ensured the balancing of their opposed forces and properties.

The idea of balance and measure, as an expression of some sort of regulating or blending principle of opposites, is found in many eras and regions of Greek thought. *Harmonia*, originally meaning 'a fitting together', was one name among many that the ancient Greeks used to name this principle of balanced reconciliation. The use of *harmonia* as this principle of regulation and orderliness, however, became more and more common in the 5th and 4th centuries B.C. There were very good reasons for this.

With the Pythagorean discovery that simple numerical ratios underlie the basic consonances in music, there was evidence, for the first time, that underlying beautiful or pleasing physical phenomena were simple proportions. The octave was expressible as a ratio of 2:1 (of string lengths, diameters of bronze discs, or variously filled vessels), as was the fifth by the ratio 3:2, and the fourth by the ratio 4:3. Furthermore, the octave itself was not only viewed as the proportionate blending of the opposites high and low, but it was also made up of these two smaller concords which themselves were the proportionate blending of the high and the low. The ontological structure of the octave is illustrated in the following diagram:



String lengths 9 and 8 were thought to be the arithmetic and harmonic means respectively between string lengths 12 and 6, and could be mathematically calculated given the two 'extremes'.

These ratios (2:1, 3:2, 4:3) and the numbers of which they are composed (1, 2, 3 and 4) were privileged and normative. They not only described pleasing natural phenomena, but contained within these ratios themselves were the ideas of beauty, symmetry, order and definiteness.

As John Burnet wrote, the Pythagorean discovery of the numerical ratios underlying concordant intervals in music was to change ancient Greek science, as it suggested a new kind of relation between the opposites that make up the physical world. He wrote: "If a perfect attunement (*harmonia*) of the high and the low can be attained by observing these ratios, it is clear that other opposites may be similarly harmonised".[9] Greek thinkers previous to the Pythagoreans were employing opposites and the ideas of measure and balance in their descriptions of the physical world. With the discovery of the ratios underlying the opposites in concords, there was a new model for the reconciliation of the opposites employed in these other areas of Greek thought. The same ratios that describe the consonances in music came to be used in descriptions of other pleasing physical phenomena (for instance Aristotle's description of red and purple).

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[9] John Burnet, *Early Greek Philosophy*, (fourth edition) Cleveland (1930): 112.

The Greeks treated this new model of reconciliation as an improvement on earlier regulating and blending principles. This is evidenced by their use of *harmonia* as a reconciling principle more and more often in these centuries. The reason for this seems to be that number and proportion were thought to imply more stability than other earlier principles (e.g. Justice, Marriage, etc.). As the concept of number became more removed from the physical world, more abstract, it came to be associated more and more with an unchangeable metaphysics which was responsible for the existence of the physical world, and knowledge. For example, in the *Philebus*, Plato, writing about the introduction of number into philosophy, wrote that ratios put an end to the conflict that exists between opposites by making them well proportioned and harmonious; it is by the introduction of number that this conflict ceases (*Philebus* 25e-26a). The introduction of number, or more specifically the simple ratios from music theory, make the opposites that make up the physical world well proportioned, harmonious, beautiful and good. Number and *harmonia* provide the physical world with an underlying stable structure and order. They give the cosmos metaphysical magnificence and moral beauty.

It was not, however, just the cosmos that ended up being described in this way. The Greeks used opposites in many disciplines and crafts. Psychology, ethics, medicine, physics and politics all employed opposites in explanation, and thus, presumably by association, these disciplines also came to make use of number and harmony. Strikingly, with this also came the belief that harmony in one entity could affect the harmony somewhere else. For example, according to some authors, harmony in music could affect the harmony contained in the soul, and furthermore, harmony in the cosmos could affect the harmony of communities and individuals, and vice versa.

In the following chapters, I shall fill out the previous skeletal argument. Section One (chapters 2 and 3) is comprised of the story of how the ideas of polarity, *harmonia* and number came to be associated in the minds of the Greeks. Chapter 2 contains an analysis of the different uses of polarity in mythology and philosophy, as well as a discussion of how worth was expressed by means of both the opposites themselves as well as their reconciling principles. In Chapter 3, I examine how number came to be associated with *harmonia* in Pythagorean thought, and thus how it came to be used in the previously existing models of reconciliation.

Section II (chapters 4, 5 and 6) forms the bulk of my thesis. It is, in the main, composed of a discussion of the application of musical ontology in the various subfields in philosophy--in theories of the body and soul, and in cosmology. I attempt to show that musical *harmonia* was not only used as an analogue for explaining the unknown, but often its structure was literally imported into other disciplines.

In addition to an analysis of the use of musical ontology in ancient Greek philosophy, there is also, in Section III, an examination of one of the philosophical problems that the use of such musical ontology created. As will become apparent, the idea of *harmonia* contained the idea of stability. Yet there seems, at least on the surface, no good reason for this to be the case. What will emerge in this chapter is that the Greeks seemed to believe that *harmonia* provided a limited stability to that which it brought together. The reasons that they gave for this stability is based in part on Greek aesthetic presuppositions, but it is also based on their belief that *harmonia* gave a stable numerical underpining to the chaotic physical world.

My project, then, is to examine the rise and use of musical metaphor and ontology in ancient Greek philosophy. It is my view that like the steam engine in the 19th century, and like computer technology today, music theory provided Greek scientists and philosophers with a direction and a theoretical framework or analogue for explaining the unknown. Yet like the use of any metaphor in science, the employment of the music analogy influenced the course that science was to take over the following ages. We are now coming to realize the importance of the mechanized world view in the early modern era. We have yet to determine the impact of the present electronic technology on both our language and ultimately our science. What needs to be unravelled is the impact that musical thought had on classical, Hellenistic, Roman, medieval and finally Renaissance and early modern thought.

SECTION I

As has been previously mentioned, to understand the use of musical thought in ancient Greek philosophy, one must understand how three different ideas are connected--these ideas being polarity, *harmonia* and number.

In ancient Greek thought, the use of polarity in explanations of the various facets of experience was widespread. Mythology, early natural philosophy and ethics, and Classical philosophy all made considerable use of opposites to account for and explain the world, and this use of polarity, as well as the conception of opposition itself was to change through time. It is not, however, widely recognized that there are several kinds of polarities in Greek thought. Nor is it widely recognized that in each of these different kinds or uses of polarity, value--both negative and positive--is present. In one sort of polarity, found primarily in physical descriptions of the world, the terms are non-axiological. Neither opposite is treated as having positive or negative worth, at least insofar as they were used in explanations of the world. In another sort of polarity, the terms are axiologically equal. In the cases that I shall be considering, both opposites were defined positively, yet both have a negative worth. Finally, there is a sort of polarity in which the terms are axiologically different from one another. One term was viewed positively, while the other was seen to be negative, either with regard to ethical, ontological or epistemological worth.

As shall be illustrated, positive value is found in all three kinds of polarity, even in non-axiological opposites and axiologically equal opposites. In some contexts positive worth is found at the level of the opposites, and in other contexts value is found in an external principle that was meant to bring together the opposites in some suitable way.

As an expression of positive worth, the principle of *harmonia* was used by the ancient Greeks in each of these sorts of polarity. How it was used, however, is different in each case. Because *harmonia* had many meanings and associations, it was applicable to many conceptions of the regulation and/or reconciliation of opposites.

In this section, I shall look at early instances of these ideas and, thus, the story of how polarity, *harmonia* and number came to be interrelated. Chapter 2 contains an examination of these three kinds of polarity as well as a discussion of how worth was expressed in each of the three contexts. In Chapter 3, I shall examine how number came to be associated with *harmonia* in Pythagorean thought, and how *harmonia* was conceived as a regulating and reconciling principle in each of the three sorts of polarity.

Chapter 2

Polarity and Value

The use of opposites by the ancient Greeks was ubiquitous, and this use was not unique to any particular area of thought. Early mythology and cosmogony employed polarity in creation stories; in ethical thought appropriate behaviour was viewed as opposed to either one or two inappropriate behaviours; according to many early natural philosophers, change in the physical world was caused by the endless strife between physical opposites.[1]

While it is well known that the opposites played a large role in Greek accounts of nature and change, it is not as well known that whenever the opposites were invoked, some conception of value entered the picture as well. Value, expressed as either positive and negative, proper and improper, or good and bad, was connected to either the opposites themselves, or to an ontologically distinct, yet related, governing principle. It follows, as we shall see, that Greek conceptions of change and nature were inextricably connected with value conceptions applied to nature. There are three ways in which this happened.

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[1] The Greek language itself constructs antitheses, as is evidenced by the use of the *men/de* construction. Often rendered 'on the one hand'/'on the other hand' (especially in grammar books), this construction is very common in ancient Greek, even in cases where the contrast is not at all obvious.

In many cases value or worth was attributed to the proper interaction of the opposites. The worth was not concerned with any particular term in an opposition, but instead with their connection or association. For example, Anaximander and Heraclitus view opposites as being non-axiological, yet there was a positive worth attributed to the correct regulation of the successive rules of these opposites. Both terms in a polarity were viewed as ontologically equal, and devoid of any positive or negative worth in themselves. Value was found in the regulating principle which was ontologically distinct from the opposites.

In other cases, the two terms in a polarity were thought to be both inherently bad. For example, in the early history of the doctrine of the mean, opposed states were viewed as being axiologically on a par in that both had a negative worth. The axiologically positive state was in between these two negative opposites, and was thought to be some sort of mean.

Yet terms in a pair of opposites could also be viewed as having different axiological status. There was a tendency to view opposites as things or principles that differed from one another in their worth; the individual things or principles that were grouped together as an antithesis differed from one another either in their ethical or religious value, ontology or epistemology. For example, light was seen as superior to its counterpart dark, and right was the positive term of the antithesis right/left.

Thus, polarity was conceived in three different ways in ancient Greek thinking; there were three different contexts in which polarities were employed, and these contexts are marked by the terms being either non-axiological, axiologically equal, or axiologically opposed. In all three contexts the idea of worth is present, but its manifestation is different in each. In non-axiological opposites, positive worth is present in the proper interaction of the opposites; in axiologically equal opposites (where both terms were viewed as equally bad) some sort of principle was meant to mark off a place in between the two which was better--the good was manifest in the mean; in axiologically different opposites, one term was viewed as superior to the other. In the latter case, it was desired that the superior term should prevail over the inferior.

Although the use of these three different conceptions of polarity can be recognized throughout the history of Greek thought, it would be a mistake to think that the ancient writers themselves would have entirely separated them in their own minds. This is shown by the fact that the different uses of polarity are often merged in the ancient texts. Although I shall, for the purposes of clarity, treat them separately, it must be realized that the distinction is mine, not that of the ancient Greeks'. Furthermore, as will become apparent in what follows, even this conceptual separation is not always an easy task, and this is due, in part, to the fact that explanations of opposition and conflict in the natural world were haphazardly changing from the anthropomorphized warring of forces and deities to the natural conflict of opposed elements and qualities, during the period under consideration.

In this chapter I shall illustrate these three conceptions of polarity by examining early physical theories, the early doctrine of the mean, and early Greek mythology and Classical philosophy. A second section will follow in which I shall examine the different expressions of worth in these three conceptions of opposites. By so doing

I hope to show how value was connected to polarity in the minds of Greek thinkers.

(I) Three Conceptions of Polarity

(i) Non-Axiological Opposites

Even today, the individual terms in polarities are often diffused with value, even though we may try to make them value-free. For example, although the opposites up/down can be viewed as non-axiological or equal both ethically and ontologically, we may associate 'up' with social climbing, cheeriness, heaven, truth and purity, and conversely, 'down' with career setbacks, financial losses, unhappiness, hell, and moral depravity. A term, however, may not always be associated with a positive value. Quite often, what is the 'positive' term in one context may be the 'negative' or inferior term in another. For example, the colour white is often associated with positive ideas, e.g. purity, etc., but there are other contexts in which white is associated with the negative, e.g. illness ("His pallor was a ghostly white"), chaos (white noise), etc. Furthermore, in some contexts, opposites are viewed as truly value-free. For example, up/down and white/black have little or no positive or negative value associated with them when used in the context of scientific description.

The tendency to view opposites in different ways injk different contexts is also common in ancient Greek thought. For example, day may have been thought to be superior in some way to night, but as physical phenomena, they were both necessary and equal. Similarly, although heat may have been associated with life, and coldness with death, as physical principles they were seen as ontologically equal qualities that were both necessary for generation and growth. Thus in the context of physical explanation, opposites were commonly viewed by the ancient Greeks as non-axiological, even though in other contexts the same terms may have been infused with positive or negative worth.

Non-axiological opposites were used by the ancient Greeks in two areas of explanation. On the one hand, these opposites were employed as principles in the physical world whose interaction and mutual antagonism was meant to explain change. On the other hand, non-axiological opposites were commonly thought to be the elements which made up those mixtures that formed bodies and substances in the physical world. Non-axiological opposites were thus extremely important in ancient physical philosophy as they were vital components in explanations of natural change and the composition of body.

Examples of the use of non-axiological opposites in explanations of change can be found in the thought of many ancient authors. For example, Anaximander's one surviving fragment is as follows:

> And the source of coming-to-be for existing things is that into which destruction, too, happens *according to necessity; for they pay penalty [dike] and retribution to each other for their injustice according to the assessment of Time.*[2]

The theory here is that all things come to be from the indefinite or *apeiron*. Although there is no explicit mention of opposites here, as Kirk, Raven and Schofield have written, "It has long been observed that the things which commit injustice on each other must be equals, different but correlative; and that these are most likely to be the opposed substances which make up the differentiated world" (KRS, 119). Thus, what Anaximander seems to be positing is that the world is composed of forces or things which, being in conflict with one another, struggle for supremacy. One force is continually doing injustice to its respective opposite, and consequently, must be punished for its attempt to overstep its bounds. For instance, when it is day, night is being wronged in that day is predominant.

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[2] As translated by G.S. Kirk, J.E. Raven, and M. Schofield in *The Presocratic Philosophers*, Second Edition, Cambridge (1983): 108. The italics indicate the agreed actual fragment of Anaximander. References to this volume will hereafter be cited as 'KRS'.

These warring opposites or struggling forces appear to be Anaximander's mechanism that explains and safeguards change in the natural world; with stasis comes death as there are no seasonal changes, no succession of days, no generation. There seems to be, however, another mechanism that makes this change relatively periodic, and this is Time, who assesses the penalty that each should pay to the other. Without Time, physical change would become chaotic as there would be no principle which regulated the successive domination of the opposites.

The idea that opposites can account for change in the physical world is also (albeit obscurely) found in Heraclitus. For example, DK Fragment 80 reads "It is necessary to know that war is common and right is strife and that all things happen by strife and necessity".[3] Coupled with his fragments concerned with fire,[4] in which the idea that bodily elements change into one another in due measure, it is plausible to think that Heraclitus believed both that change was safeguarded by the continual exchange of elemental domination, and that this change was measured and regulated by some principle (perhaps the divine Logos, God, Zeus, Harmonia, etc.).[5]

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[3] As translated by Kirk, Raven and Schofield, p. 193.

Diogenes of Apollonia also conceived of physical change in this way. He wrote the following:

> Such a distribution would not have been possible without Intelligence, (namely) that all things should have their measure: winter and summer and night and day and rains and winds and periods of fine weather; others things also, if one will study them closely, will be found to have the best possible arrangement.[6]

A number of opposites are named each of which is a period of time. These are measured by Intelligence, a principle which is distinct from the opposites, so that each presumably dominates for a relatively equal amount of time, or the right amount of time. Thus we see here the idea of opposed physical phenomena which must be regulated by an external principle. Again it is clear that positive value is attributed to the proper interaction of the opposites. Indeed, Intelligence has arranged them and regulates them in the best possible way.

Closely related to the idea of the regulated succession of non-axiological opposites is the idea that the world is composed of elements which change into one another in a

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[4] See DK Fragments 30, 31, 64 and 90.

[5] See KRS, page 204 for their commentary on this idea.

[6] DK Fragment 3 as translated by Kathleen Freeman in *Ancilla to the Pre-Socratic Philosophers* Cambridge, Massachusetts (1957): 87-88.

regulated manner. For example, Empedocles wrote that "...there is no creation of substance in any one of mortal existences, nor any end in execrable death, but only mixing and exchange of what has been mixed...".[7] Anaxagoras too wrote that "No thing comes into being or passes away, but it is mixed together or separated from existing things" (DK B17, trans. Freeman p. 85). We see this idea in Diogenes of Apollonia as well:

> ...all existing things are created by the alteration of the same thing, and are the same thing.... For if the things now existing in this universe--earth and water and air and fire and all the other things which are seen to exist in this world: if any one of these were different in its own nature, and were not the same thing which was transformed in many ways and changed, in no way could things mix with one another, nor could there be any profit or damage which accrued from one thing to another, nor could any plant grow out of the earth, nor any animal or any other thing come into being, unless it were so compounded as to be the same. But all these things come into being in different forms at different times by changes of the same (*substance*), and they return to the same. (DK B2, trans. Freeman p. 87)[8]

Thus the elements were thought to change into one another or be mixed with one another in such a way as to explain change in the physical world. Furthermore, in many cases, there was another principle which was meant either to regulate this change, or else account for the elements' mutual attraction or repulsion.

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[7] DK Fragment 8 as translated by Freeman, p. 52.

[8] See also Plato's *Phaedo* 70e-72e.

Another related use of non-axiological opposites is found in descriptions of how the physical elements were mixed to form both inanimate and animate bodies. Body was often thought to be composed of a mixture or blending of elements which have contrary qualities. In some theories it was postulated that the elements had to be in particular ratios with one another in order that the body be well-formed, beautiful or healthy.[9] Thus, once again there is a use of an ontologically distinct principle which characterizes a positive state of the interaction or blending of opposites.

Non-axiological opposites were thus extremely important in ancient Greek physical theories. (1) Their mutual antagonism was the mechanism which explained change in the physical world, (2) their exchange, mixture and separation was thought to explain growth and diminution, creation and destruction of body, and (3) composite body, both animate and inanimate, were thought to be mixtures of non-axiological opposites.

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[9] See chapters 4 and 6 on somatic harmony and cosmic harmony for discussions of this sort of polarity and unifying principle.

(ii) Excess, Deficiency and the Mean in Ancient Ethics

A very different notion of polarity is found in ancient Greek ethics. This is the idea that an ethical standard can be expressed as a midpoint or mid-region between two extremes: an excess and a deficiency. The opposites here, excess and deficiency, differ from one another in their content, and both are given a positive description: one is too much of something, and one is too little. Both extremes or opposites, however, are equally bad or undesirable forms of behaviour. Thus, the opposites are axiologically equal. Proper behaviour was thought to lie in between these extremes, and was expressed by the terms *kairos* or *metron*.

In its earliest forms, this mean ethical standard was commonly expressed as the idea of moderation, without explicit mention of the extremes (in particular, without explicit mention of the deficient state), and without explicit mention of this mid-region. Often the ideas of measure (*metron*), limit and appropriateness (*kairos*) were invoked to express moderation, as well as the oft-repeated phrase *meden agan*, "nothing in excess".

As John Wilson has noticed, the Delphic maxim *meden agan* was not balanced by its opposite "nothing too little" (*meden elatton*), and he believes that one should distinguish a bipartite from a tripartite pattern in this tradition.[10] The bipartite pattern consists only of the contrast between moderation and excess, whereas the tripartite involves a mean between two opposite states: excess and deficiency.

The bipartite tradition seems to stem from this Delphic graffiti (i.e. *meden agan*). The idea expressed is that too much of anything is bad, presumably for both the body and the soul. Instead, one should be moderate in one's actions and desires. Furthermore, coupled with the other famous Delphic maxim, *gnothi seauton* ("know yourself"), the idea emerges that one should know one's limits, one's place; one should not exceed these limits. The idea of *hubris* is close here. Excessive pride of strength and passion leads to trouble. One is human, and one should remember it.

This sentiment is repeated often in the early literary tradition. Theognis wrote "Don't pursue anything too much (*meden agan*): *kairos* is best in all the deeds of mankind" (Theognis, 401),[11] and Critias fragment 7 reads "The Spartan

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[10] See John R. Wilson's "*Kairos* and the Aristotelian Mean", to be published in 1996 as part of the Proceedings of the *Kairos* Conference held in Aix, 1995, page 1. This article will hereafter be referred to as 'Wilson, 1996'.

[11] As translated by John Wilson. For a detailed analysis of this passage, and the following passages containing *kairos*, and an argument for a non-temporal, early meaning of *kairos*, see John Wilson's "*Kairos*

Chilon was wise, who said the following: 'Nothing too much (*meden agan*): all fair things belong to *kairos*'".[12] We have here the first expressions of the positive, desired state. In addition to what would have been the familiar adage which was meant to remind one not to be excessive, here one finds expression of the goal of proper behaviour; that which belongs to *kairos*, or due measure--moderation.

The expression of moderation by means of the bipartite model is also found in Hesiod. In *Works and Days*, Hesiod gives advice not only about the proper time that one should sail a ship, but also about the proper loading of one's cargo. One should not put all of one's goods in one ship, for if the boat should meet with disaster, then the whole of one's livelihood could be lost (*Works and Days*, 689-691). In the same way, he thinks that "it's a terrible thing if by overloading your wagon/ you should shatter its axle and ruin what you are carrying./ Maintain measures (*metra*): *kairos* is best in everything".[13] Again, we find the idea that excess is bad or imprudent, whereas the proper measure or

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as 'Due Measure'" in *Glotta* 58 (1980): 177-204. I owe much of the following argument to John Wilson and Richard Bosley.

[12] Translated by Wilson. Chilon, who presumably lived in the mid 6th century, was one of the seven wise men according to Plato and others.

[13] *Works and Days*, 692-694, as translated by R.M. Frazer in *The Poems of Hesiod*, Oklahoma (1983).

measures is best. This passage, however, may not be just an example of the bipartite structure. Although Hesiod's formalized version of this idea is based on the bipartite version of the doctrine of the mean, there is a hint of the imprudence of carrying too little in this section of *Works and Days*. Lines 643-645 read "Praise the ship that is small but put your load in a large one,/ for the greater the load the greater the gain upon gain/ coming to you, if only the winds don't blow you destruction" (trans. Frazer). These lines suggest to me that Hesiod also thought that carrying too little wouldn't be very prudent. If one's going to make the trip, one might as well carry as much as one can, as long as one doesn't get carried away and take everything at once. One must balance gain with potential risk. This observation is in agreement with John Wilson's general claim that examples of the tripartite model "tend to be physical or medical in nature" (Wilson, 1996: 1). Although Wilson has not classified this passage as an example of the tripartite scheme, this is understandable given the context in which the word *kairos* appears.[14]

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[14] This is true only in Wilson (1996). In his article of 1980, he wrote the following of the Hesiod passage: "*Kairos* is here 'the right degree' between too much and too little" (Wilson, 1980: 179). However, he does gauge the context to be the overloading of a wagon (ibid.: 178).

There are other passages that link the ideas of *metron* with *kairos*, and implicitly suggest a deficient state. Pindar justifies a compressed version of his client's past victories by writing that a discriminating audience enjoys listening to the development of a few points instead of the whole of a large topic; "*kairos* gives the gist of everything just as well" (*Pythian* 9.78).[15] Likewise, at *Olympian* 13.48, instead of giving a complete list of his client's athletic victories, he writes that "Measure attends everything: *kairos* is the superior knowledge".[16] In these two passages, what is explicit is that excess does not belong to measure or *kairos*, which is the content of the traditional maxim. At the same time, however, Pindar would have been careful not to skimp with his praises. What he strove for would have been a balance between over- and under-praise, and presumably economy of space.

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[15] Translated by Wilson (1980): 181.

[16] Ibid. Although the context of this passage shows that its province is rhetorical speech, there is a striking similarity between it and an idea which, following Huffman, I have attributed to Philolaus in Chapter 3. This is the idea that everything has number, and we know something by knowing its number. The conclusion that I shall draw is that the knowledge involved amounted to knowing its structure and the relationships that held between its various parts. The idea found in Pindar is similar to this if we see him as a maker, as opposed to an observer (as Philolaus was to the universe). Everything has a measure, but it is due or proper measure (*kairos*) that makes something well-proportioned. Thus knowledge of it is superior, as the products of one's making will be fair.

Within the writings of Pindar, two other ideas about *kairos* or 'due measure' emerge which suggest an implicit deficient state. The first is that *kairos* is a target at which one should aim. For example, he writes at *Nemean* 1.18 that he has "touched on many things, striking the target (*kairos*) unerringly",[17] and later at 8.4, that "[in] every deed, it is good by not straying from *kairos* to fulfil one's better aspirations".[18] By metaphorically casting *kairos* as a physical target, it is even easier to see how a deficient as well as an excessive state is implied. One must neither fall short of, nor overshoot *kairos*.

Furthermore, according to Pindar this target is small. He writes, "From the human point of view, *kairos* has only a small tolerance (*metron*). He knows this well, and serves it willingly, not as a drudge" (*Pythian*, 4.286).[19] This target, therefore, has a small area--a small region in which actions are thought to be good, and presumably, on either side of this target are regions whereby actions are either deficient or excessive.

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[17] Translated by Wilson (1980): 182.

[18] Ibid: 185.

[19] Ibid: 185.

The idea that *kairos* 'has a small tolerance' is exemplified by the following passage from *Isthmian* 2.22 in which Pindar describes how a charioteer, as he goes around the turning post in a race, shows a skilful hand "which he applied to all the reins in proper measure (*kata kairon*)".[20] The goal of the charioteer's actions is to win the race. Thus, he must go as quickly as he can around the post. He must, however, be careful not to go too quickly since he may crash. Therefore, in this example, the deficient state would be going too slow, which would result in losing the race, and the excessive state would be going too fast, which could result in death. The charioteer aims at a speed which is inbetween deficient and excessive speed--balances the two risks--with the aim of avoiding both unsavoury results.

An explicit example of the tripartite model of the doctrine of the mean is found in Aeschylus' *Agamemnon*. At 769-771, the Chorus wonders how to praise Agamemnon properly: "How should I address you? How should I revere you,/ neither raising too high nor falling short/ in the right measure (*kairos*) of gratitude".[21] Again, *kairos* is the target, and on either side is an undesirable behaviour; on the one side defect, and on the other, excess.

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[20] Ibid: 186.

[21] Translated by Wilson (1996): 6.

A slightly different conception of the doctrine of the mean arises from an examination of those passages that use the word *meson* to describe the desired state instead of *kairos*. While the idea of a defined target is not as clear as the word *meson* ('middle') would itself imply, the idea of two undesirable states on either side of the mean is almost always apparent.

Often *to meson*, signifying a mean, is found in political contexts. For example, Theognis advised Cyrnus not to "get upset when the citizens are in tumult, but take the middle road (*mesen ercheu ten hodon*)" as he does (Theognis, 219-220).[22] A little bit later similar advice is given: "Quietly walk as I do on the middle of the road, Cyrnus, and do not give the property of one side to the other or vice versa" (Theognis, 331-332). A more general statement of this political mean is found just three lines later: "Be not over eager in any matter--midst is best in everything--and thus shalt thou have virtue, Cyrnus, which is a thing hard to come by" (Theognis, 335-336). Like the passages that used *kairos*, these passages describe a positive state and this state is described in terms of a spatial metaphor; in this case, a road. What is different about them, however, is the fact that the mid-region does not seem as exact or small as the descriptions using *kairos*. Although it may be hard to achieve this middle state, as is written in the last of the above three passages, the idea of walking down the middle of a road suggests that one could take a number of 'middle-paths', and yet still be considered to be 'walking in the middle'. Furthermore, as a road cannot be a road without boundaries, the two extremes, although without content in these passages, are clearly called to mind. Thus, unlike *kairos* which focuses on the positive state, the idea of *meson* more explicitly includes the idea of the extremes.

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[22] The following three passages from Theognis are translated by Wilson (1996).

A more developed version of this political mean using *meson* is found in Aeschylus' *Eumenides*. The Furies say the following:

> Neither the life of anarchy
> Nor the life enslaved by tyrants, no,
> Worship neither.
> God gives dominion to everyone(thing) in between (*panti meso*);
> The laws of god may veer from north to south--
> We Furies plead for Measure.
> (Aeschylus, *Eumenides* 536-541)[23]

In this passage, both extremes are explicitly defined, and thus given content, presumably anarchy being the deficiency, and despotism the excess. Furthermore, the middle is exalted; those who choose this path receive god-given power.

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[23] Translated by Wilson.

A further example of an explicit tripartite pattern of the doctrine of the mean is found in Theognis. He wrote the following:

> 'Tis sure there are two evil Spirits of drinking among miserable men, Thirst that looseth our limbs and grievous drunkenness; I shall go to and fro between these twain (I shall frequent the middle point), nor wilt thou persuade me either not to drink or to drink too much.
>
> (Theognis, 837-840)[24]

Again, the two extreme states, excess and deficiency, are given content, and are thought to be bad. The mean or moderate state is described as *to meson*, and it is viewed as good or appropriate behaviour.

(iii) The Sacred and the Profane: Axiologically Different Opposites

In Greek mythology and religion, examples of antitheses were prevalent, and often played an important role in the various theogonies and creation stories. G.E.R. Lloyd writes that one such opposition was sky and earth. According to him, this pair of opposites was associated with "two fundamental religious antitheses, (1) the distinction between Olympian and chthonic deities, and (2) the general opposition between gods and men".[25] Other pairs of opposites that had significance for the ancient Greeks were right/left, male/female, light/dark, north/south, east/west, hot/cold, wet/dry, up/down, etc.

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[24] Translated by Wilson (1996).

In pairs of opposites today, we often define one term positively and one negatively. For example, we may give one term a positive definition, as in the case of 'legal', and then define its opposite negatively, e.g. 'illegal' meaning 'against the law'. The Greeks have a strong tendency to link this sort of opposition with the principles of Being and Privation, so that, for example, in the case of white and black, depending on context, one was thought to be a positive state, and the other the absence of this positive state.

When one begins to look under the surface of Greek conceptions of polarity, however, one finds a surprising number of cases in which there is an attribution of worth to one term in the pair of opposites. It was not just the case that one term was *defined* positively, and the other negatively, but there often was a positive or negative *worth* associated with individual terms in a pair; in many pairs of opposites one of the terms was perceived to be superior to the other. This is especially apparent in early Greek thinking, and can be demonstrated quite clearly by looking at the pairs right/left, male/female, and light/dark.

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[25] G.E.R. Lloyd, *Polarity and Analogy: Two Types of Argumentation in Early Greek Thought*, Cambridge (1966): 41-42.

The Greek word for *right* is *dexios* which also means *fortunate* or *boding good* in the context of auspice or bird augury.[26] Metaphorically, it means *dextrous, ready, shrewd* and *clever*. There are three Greek words which mean *left*. The first, *skaios* also means *western* or *westward* (which was the inferior part of the pair east/west), *unlucky, ill-omened*, and metaphorically *awkward, clumsy* and *uncouth* (like the French *gauche*). The other two Greek words for *left* were euphemisms. The first is *euonumos*, and the second *aristeros* which also meant *boding ill, ominous* and *clumsy*.[27]

The tendency to think that *right* is superior to *left* is not confined to the Greeks. For example, in Latin, the word for *right* is *dexter* which also meant *skilful, powerful* and *brave*. One word meaning *left* was *sinister* which, in addition to how we now use the word, also meant *awkward, wrong, perverse* and *unfavourable* (again in the context of bird augury). *Laevus* also meant *left*, and metaphorically *foolish, silly, unsuitable* and *unlucky.*[28] Furthermore, the idea that right was superior to left is not confined to religious, or magical thinking. Indeed, it is apparent in Parmenides (DK B17), Anaxagoras[29], the Hippocratic Corpus[30] and the cosmological and biological works of Aristotle.[31]

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[26] See Liddell and Scott's entry for *dexios*. For an explanation of the art of bird augury, see Valerie I.J. Flint's *The Rise of Magic in Early Medieval Europe*, Princeton (1991): 116-119.

[27] See Liddell and Scott.

The perceived superiority of males over females is of course not a surprising theme, nor is it idiosyncratic to the pre-philosophical Greeks. Almost any survey of Greek literature will reveal the strong Greek presupposition that males are superior to females. Although Plato is often, anachronistically, called a 'feminist' because of his view in the *Republic* that women too could be members of the guardian class,[32] there are many other examples in the dialogues that point to a strong presupposition that males are superior to females. For example, in the *Laws* he wrote,

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[28] See *Cassell's Latin Dictionary* (1948).

[29] At 763b31-764a2 in *Generation of Animals*, Aristotle wrote "the seed, as [Anaxagoras and other of the physicists] say, comes from the male while the female only provides the place, and the male is from the right, the female from the left, and so also that the male embryo is in the right of the uterus, the female in the left" (trans. A. Platt as found in *The Complete Works of Aristotle, Vol. I* (ed. Jonathan Barnes), Princeton (1984). Unless otherwise indicated, all passages from Aristotle will be taken from this two volume set.

[30] See the Hippocratic *On Superfetation* chp. 31 for the view that seed from the right testicle produces male children and seed from the left produces females. Also see Aristotle's *Generation of Animals* IV 1, 765a22ff.

[31] See for example *De Caelo* II 2, 284b24ff., *Progression of Animals* chps. 4-6, *Parts of Animals* III 3, 665a25-27. As G.E.R. Lloyd wrote of Aristotle, "A detailed knowledge of different biological species, in many of which no distinction, or no marked distinction, between right and left is found, did nothing to uproot Aristotle's belief that right is naturally stronger and more honourable than left. On the contrary, that knowledge led him to conclude that the differentiation between right and left is a mark of man's superiority to the animals, and of his greater perfection" (*Polarity and Analogy*, p. 55).

> [The] very half of the race which is generally predisposed by its weakness to undue secrecy and craft--the female sex--has been left to its disorders by the mistaken concession of the legislator... Woman--left without chastening restraint--is not, as you might fancy, merely half the problem; nay, she is a twofold and more than a twofold problem, in proportion as her native disposition is inferior to man's.
> (*Laws*, 781a-b)[33]

Furthermore, in the *Timaeus* Plato writes that if a man fails to subdue and conquer the irrational part of his soul, he will, in his next incarnation, pass into a woman (*Timaeus* 42b). There was also, in Plato's mind, a link between males and females and the public and private. It was man's task to rule, both publicly and in his household, and it was a woman's task to be the obedient mistress of the household--to give birth to legitimate heirs, and to watch over the possessions of the house (of which she was one).[34]

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[32] See *Republic* 451d-457b and *Timaeus* 18c-d. That women too can be guardians is again brought up at the end of Book VII (540c). G.M.A. Grube writes of this later passage that "It reads almost as if Plato had to remind himself!" (p. 167 of *Plato's Republic* Indianapolis (1974)).

[33] Translated by A.E. Taylor in *The Collected Dialogues of Plato* (ed. Edith Hamilton and Huntington Cairns), Princeton (1961). All passages from Plato will be taken from this volume unless otherwise indicated.

[34] *Laws* 805d. This link between males and females, and the public and private was not idiosyncratic to Plato. Indeed it was a common Greek idea. For an interesting discussion of this issue as well as Xenophon's classic *Oeconomicus*, see M. Foucault's *The History of*

Aristotle too believed that males were superior to females. This may be illustrated in part by his views on generation. Not only do females play a passive part in copulation,[35] but females also play a passive role, indeed are the passive principle, in the formation of the fetus. The male is the principle which contributes the formal and the efficient causes to generation, whereas the female contributes only matter.[36] The semen of the male must 'work upon' or concoct the material contributed by the female[37] (material which, incidentally, "has in its nature an affinity to the primitive matter" (*Generation of Animals* I 20, 729a29-33)). The female, both as a principle and with regard to what she contributes to the formation of the fetus, is "a mutilated male, and the menstrual fluids are semen, only not pure; for there is only one thing they have

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Sexuality, Vol. 2: The Use of Pleasure, New York (1985): 143-184. The idea in the *Republic* that wives and children (i.e. "the possessions of friends") be held in common (423e), is cast in a slightly different light once the ideas from the *Laws* are brought forward.

[35] See *Nicomachean Ethics* VII 5, 1148b33. In this passage Aristotle is commenting on the various brutish states of humans, some of which arise because of deformities, madness or disease, others because of habit or custom, others by nature. Aristotle believes that it is just as inappropriate to call those whose brutishness is caused by nature incontinent as it is to call women incontinent "because of the passive part they play in copulation".

[36] See *Generation of Animals* I.20, 729a9-10 and II.4, 738b20-21. The male is a principle "in virtue of a certain capacity and the female is such in virtue of an incapacity" (*GA* IV.1, 766a30-31).

[37] See *Generation of Animals* IV.1, 766a30-33 and IV.1, 766b12-15.

writes, "For that which can foresee by the exercise of mind is by nature lord and master, and that which can with its body give effect to such foresight is a subject".[42]

That women are inherently weak, immoderate, cowardly and even evil is an idea that goes far back in Greek thought. Indeed, Hesiod even goes so far as to write that women are the cause of *all* evil in the world. In the *Theogony* when he is describing the creation of women as punishment for Prometheus' deceit, he wrote that "Women, a great plague, make their abodes with mortal men, being ill-suited to Poverty's curse but suited to plenty (*Theogony* 592-3).[43] Just a few lines later is the following:

> Even so Zeus the Thunderer on High created women/ as an evil for men and conspirers in troublesome works./ And in exchange for a good he gave a balancing evil./ Whoever flees from marriage and women's mischievous works,/ being unwilling to wed, comes to baneful old age with/ no one to care for his needs, and though he has plenty to live on/ while he is living, collateral heirs divide his possessions/ when he is dead. As for the man who is fated to marry,/ if he obtains a virtuous wife, one endowed with good sense,/ throughout his life evil and good alternate endlessly./ But that man who obtains a wife who is thoroughly bad/ lives having deep in his breast a pain which never subsides/ fixed in his innermost heart, and this is an evil incurable.
> (*Theogony* 600-612, trans. Frazer)

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[41] See Aristotle's *Politics* I.5, 1254b13-15 and I.12, 1259b3.

[42] *Politics* I.2, 1252a31-33. See also III.4, 1277a5-9 where he compares soul, rational principle, and husband, to body, appetite, and wife.

[43] Translated by Frazer.

Thus, the Greeks held a strong presupposition that males are superior to females, with regard to their natural characteristics and as an explanatory principle.

The opposites light and darkness were also common in pre-philosophical Greek writings, and, of course, light was perceived to be superior to darkness. The Greek word *phaos* meant *light* and *daylight*, and metaphorically, *joy, deliverance, happiness* and the like. Night (*nux*) also meant *gloom, darkness, murkiness* and *death; euphrone*, a synonym for *nux*, is a euphemism, meaning *the kindly time*.[44] Furthermore, in Hesiod's *Theogony*, Night is linked with the following negative forces by being her progeny: the spirits of death (Moros and Ker), Thanatos, Hypnos, the spirit of blame (Momos), Misery, the avengers of evil (the Moirai and Keres, "who pursue the transgressions both of men and gods,/never relenting until as demons of terrible wrath/ they have wreaked a dire retribution" (220-222)), Nemesis, Deceit, Sexual Love, Old Age and Eris (Strife).[45] Eris in turn begets burdensome Labour, the curse of Forgetfulness, Hunger and Pain, the conflicts of Battle and Fights and Murders and Killings of Man, Quarrels and Lies and Words and

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[44] See Lloyd's *Polarity and Analogy*, pp 42-3.

[45] Hesiod's *Theogony* 211-225, trans. Frazer.

Disputations, Disorderly Government and the power of Ruin, and "the oath-god Horkos, who is the greatest plague for/ every man on the earth who wilfully swears a false oath".[46]

From the above examples, the idea of individual terms in a pair of opposites being on unequal footing emerges quite clearly; one term (i.e. the sky, right, male and light) is unquestionably superior, more friendly, or positive than the other. Furthermore, with the exception of light, the positive terms are discretely separated from their negative counterparts. Even light can be seen in this way. Light, viewed as a positive anthropomorphized entity (as it is in Hesiod), is completely separate from Darkness; although dawn and twilight seem to be a mixture of the two, when light and darkness are anthropomorphized, it is conceivable that dawn and twilight were those times of day in which the two entities changed dominion.

Why the Greeks used this type of classification has yet been and will, for the most part, remain unaddressed. It will be, however, somewhat illuminating to review briefly what some modern commentators have thought is the origin of this sort of antithesis.

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[46] Lns 226-232; lns 231-232 quoted directly from Frazer's translation.

Francis Cornford[47] has argued that the prototype of contrariety in Greek thought is sex (as a principle of social organization in primitive societies); John Burnet has claimed that the observation of the transitory, and cyclical character of nature formed the model for the doctrine of opposites;[48] and G.E.R. Lloyd believes that the use of opposites by the ancient Greeks arose from certain religious distinctions--the distinction between the sacred and the profane.[49] Although both the ideas of sex and the polarity that is found in the natural world have a degree of plausibility as those natural antitheses that formed the bases on which other antitheses were modelled (perhaps those antitheses in which the opposites were on equal footing), I think that the type of polarity found between the ideas of the sacred and the profane is the most fitting prototype of the sort of antithesis that we have so far found in Greek thinking, as it explains why the Greeks would have classified observed natural oppositions as having a hierarchical structure: a naturally superior and inferior term. Furthermore, the ethical and religious basis of the distinction between terms in polarities seems to be in the forefront of later uses of axiologically different opposites.

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[47] See pages 65-68 in Cornford's *From Religion to Philosophy*, London (1912); reprinted by Harvester Press Ltd. in 1980.

[48] In *Early Greek Philosophy*, (fourth edition) Cleveland (1930): 8. He wrote the following: "The opposition of day and night, summer and winter, with their suggestive parallelism in sleep and waking, birth and death, are the outstanding features of the world as they saw it. The changes of the seasons are plainly brought about by the encroachments of one pair of opposites, the cold and the wet, on the other pair, the hot and the dry, which in their turn encroach on the other pair." (pp 8-9).

[49] See *Polarity and Analogy*, pp 37-8.

The Pythagoreans are reported to have used this sort of opposition in their philosophy. According to Aristotle, they remarked upon ten pairs of opposites out of which they separated the two contrary terms into separate columns. If Aristotle is correct, these Pythagoreans explicitly grouped together the perceived superior and inferior terms in the polarities. Aristotle's passage is as follows:

> Other members of this same school [i.e. the Pythagoreans] say there are ten principles, which they arrange in two columns of cognates--limit and unlimited, odd and even, one and plurality, right and left, male and female, resting and moving, straight and curved, light and darkness, good and bad, square and oblong. (*Metaphysics* I 5, 986a22-26)

These pairs of opposites are clearly being viewed as antitheses in which one term is, in some way, axiologically superior to the other. Not only do we find three of the positive terms which we already found in early mythology, but the antithesis 'good/bad' is explicitly coupled with what we would have presumed to be the positive and negative columns respectively. What is surprising in this passage is that the Pythagoreans were thought to have placed limit and unlimited, odd and even, one and plurality, resting and moving, straight and curved, and square and oblong into this schema. For example, it is difficult to see how even is supposed to be the negative counterpart to odd, how oblong is the axiologically inferior to square. There may here be some overtones of epistemological inequality between these sorts of polarities; unlike the earlier examples of axiologically different opposites in which the terms are viewed primarily as differing in religious significance, here we may be seeing a difference in epistemological worth. Whether this is the case will be addressed in my discussion of Philolaus (see chapters 3 and 6).

Parmenides, too, made use of axiologically different opposites. Unlike, however, the Pythagoreans and the early usages that we saw in Homer and Hesiod, Parmenides goes far beyond the idea that what separates one term from another in a pair of opposites is ethical or religious. In his proem, Parmenides writes of his escorted journey from the "halls of Night"--of ignorance, to the Light or Truth; of the great gates and stone threshold that separates them; of Justice that guards the door. Having passed through the gates, the goddess addresses Parmenides as follows:

> No ill fate has sent you to travel this road--far indeed does it lie from the steps of man--but right and justice. It is proper that you should learn all things, both the unshaken heart of well-rounded truth, and the opinions of mortals, in which there is no true reliance. But nonetheless you shall learn these things too, how what is believed would have to be assuredly, pervading all things throughout.[50]

As Kirk, Raven and Schofield have written, Parmenides, in this passage, created an "immense gulf" between rational inquiry and common human understanding--between truth and opinion.[51] Furthermore, as is shown in DK B2, truth *is*, whereas opinion *is not*. There are, of course, many more things that could be said of Parmenides' opposition between the 'way of being' and the 'way of seeming'. For the purposes of this investigation, however, it is sufficient to notice the complete separation, in Parmenides' mind, between what is associated with light, i.e. Truth, and what is associated with darkness, i.e. opinion or falsity. This separation--the gap between the terms in the polarity--is clearly no longer a simply ethical cleavage between the sacred and the profane, good and evil. Instead there is an ontological and epistemological separation or gap between the two terms; one term in the opposition is, and is knowable, the other term is not and cannot be known.

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[50] DK B1, lns 26-32, trans. KRS, p. 243.

[51] KRS, p. 244.

Parmenides' separation of Being and knowledge and Non-Being and opinion or falsity infected ontology all the way down. Plato's metaphysics in *Republic* Books VI and VII shows striking similarities to Parmenides' views insofar as he too ontologically separates Being from Non-Being, and assigns Being as the object of knowledge and truth (and Non-Being as the object of falsity). In *Metaphysics* XII, Aristotle, in his discussion of substance and change, wrote that what is involved in the change or generation of substance is matter and a set of contraries. These opposites are more precisely defined as "the formula or form", and "privation" (*Meta*. XII 2, 1069b33-34). Thus, only form, as the positive state, is given a positive definition. Privation is just that, the absence of form. It is defined negatively and it is devoid of positive value. This is in contrast with earlier notions of axiologically different pairs of opposites in which, although only having one term that had positive value, both terms were defined positively.

From the previous survey of axiologically unequal opposition in Greek thought, the following points have emerged. (1) One term in an opposition is viewed as superior to the other, either ethically, ontologically or epistemologically. (2) The terms that make up a pair of opposites are often anthropomorphized. This is very apparent in Hesiod's *Theogony* where, for example, Day and Night are god(desses), but it is also manifest in Parmenides. Perhaps because of this anthropomorphization, (3) the terms in the polarities were viewed as discrete substances or categories--they were not seen as having a structural relationship with one another. (4) G.E.R. Lloyd's prototype of contrariety in ancient thinking (i.e. the sacred and the profane) seems a likely candidate to explain the Greeks' use of unequal opposition, in part, because (5) terms in different pairs of opposites were often grouped together according to their perceived positive and negative significance.

What has emerged from this examination of the uses of opposites in Greek thought is three very different conceptions of polarity. In the case of axiological different opposites, the terms in a polarity were viewed as discrete and anthropomorphized, and there was no structural relationship between the two opposites in each pair. Instead, one opposite was viewed as axiologically superior (either ethically or ontologically) to the other, and the superior terms were grouped together, as were their inferior counterparts. Furthermore, there was no principle which was meant to unite these opposites.

The idea of polarity that emerges from a study of the history of the doctrine of the mean--the doctrine as expressed as both bipartite and tripartite--is quite different. Although there is a similarity between the bipartite pattern and axiologically different opposites, in that both conceptions involve two terms, one of which is desirable or positive, and the another undesirable or negative, this is as far as the similitude extends. One very important difference is that the 'extremes' in the bipartite pattern (i.e. excessive behaviour and appropriate behaviour) are never anthropomorphized. Indeed, it is difficult to see how they could be. And this points to another very great difference between the two ideas of polarity; the opposites in the bipartite pattern are expressions of two different attitudes or behaviours, whereas the opposites that are axiologically unequal are discrete substances or categories. As a discrete substance, an opposite that is axiologically different cannot have an intrinsic structural relationship with its counterpart, whereas it is the nature of the bipartite pattern to allow for this possibility. Granted, there is little mention of 'degrees' in the bipartite pattern--either one's behaviour is measured or excessive--but even so, it is the nature of this sort of opposition to leave the door open for this sort of conception (as is very apparent in the physical examples of the tripartite pattern). Therefore, although there are similarities between these two conceptions of polarity--both involve just two terms which differ axiologically--the differences are far more striking than those aspects they share.

The tripartite pattern of the doctrine of the mean does not share even these superficial similarities with axiologically different opposites. The most obvious difference, perhaps, is that there are three terms instead of just two, but beyond this, the entire structure is different. In the tripartite pattern it is the opposites or extremes that are viewed as morally bad: both are axiologically negative, and it is instead an in between state or behaviour that is supposed be the model for moral action, the 'positive' term. What is more, just as we saw in the bipartite pattern, these opposites are not discrete, nor were they anthropomorphized in any of the passages we have considered. Indeed, the use of physical examples in the tripartite pattern clearly disallow a conception of discrete extremes. In these examples, there are usually 'amounts' of something that must be properly measured to be in the mean, and since quantity can vary, there will be a wide spectrum of possible measures. Further, the use of spatial metaphor (e.g. a target or road) again makes difficult the idea of discrete opposites.[52]

Although the extremes in the theories of the doctrine of the mean are ethically equal, in the sense that both are undesirable patterns for behaviour, the authors[53] did, however, put more emphasis on avoiding excessive behaviour than deficient--hence the bipartite pattern. Furthermore, the authors who do so do not seem to be conscious of this tendency. Aristotle, however, noticed it and suggested two possible explanations as to why this was the case and why it was so prevalent. The first was that human beings just naturally tend towards excessive behaviour rather than deficient. This, no doubt, has to do with the desire for the pleasures that usually attend excessive behaviour, e.g. drinking, eating, etc. The second explanation that Aristotle gives suggests that deficient states were not mentioned because there were rarely names for such behaviour.[54] One might surmise that the lack of such names had to do with Aristotle's first point: people just don't tend to the deficient state as they do to the excessive. Hence the deficient state, as a vice, wasn't very common. Aristotle tried to take this into consideration when he wrote that it is better to undershoot the mean than overshoot it. It definitely seems that the harder of the two to avoid is excess.

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[52] Where physical examples are used, in which quantities of the opposites vary, the opposites although both axiologically negative, show striking similarities to the use of non-axiological opposites. I shall develop this point in a few paragraphs. What this may point to is a development in the Greeks' use of this kind of opposition. Further, the absence of anthropomorphization in the ethical tradition of polarity may be a result of the 6th century departure from traditional divine explanations of phenomena to naturalistic explanation (as is so apparent in the thought of the Milesians as compared to Hesiod).

[53] I.e. Theognis, Critias, Hesiod and Pindar.

As was seen, however, from examples of the tripartite pattern of the doctrine, early authors did recognize the deficient state as an extreme, equal in moral badness to that of excess, but the examples that exhibit the tripartite pattern do tend to be physical, or at least to employ spatial metaphor. As I have already mentioned, John Wilson thinks that the tripartite model usually manifests itself in physical or medical examples. I think that we are now in a position to see why this is so. The physical examples tend to employ the notion of a target at which one must aim.

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[54] See *Nicomachean Ethics* II.7-9.

This naturally suggests a deficient as well as an excessive shot. Further, examples that have to do with the right measure or quantity tend to imply that there might be too little of a thing as well as too much. This is apparent in the Hesiod passage, as well as Pindar's Charioteer story (*Isthmian* 2.22).

Although the physical examples used in the doctrine of the mean follow the general pattern of axiologically equal opposites as found in the purely ethical mean, they are open to a different sort of conceptual development. As soon as the excessive and deficient states are characterized by a quantity of something, the structure is open to change. In the ethical mean, all three states are on the same ontological level, and the mean is in between two extreme states. The mean is not a mixture or blending of these two extremes; instead it characterizes a behaviour or attitude that is moderate. When, however, the extremes are things that can be quantified, the door is opened to talk of the mean state as a measured mixture or blending of two opposites. When this happens, the uni-levelled structure of the ethical mean is left behind and a two or three levelled model results which is either similar to or identical with the model found in non-axiological polarity.

John Wilson has written that the tripartite model of the doctrine of the mean manifests itself most often in physical and medical examples. This is correct. When, however, the opposites are quantified, the conception of the doctrine of the mean changes. No longer is the mean an expression of a positive state that is in between, and ontologically on a par with its two extremes. Instead the mean is a mixture or blending of two non-axiological opposites. Thus, physical and medical examples may exhibit a deficiency, excess and mean, but the opposites involved are no longer axiologically negative in the same way. The opposites are physical things which are quantifiable. Excessive and deficient states are found when the opposites are not mixed according to due proportion, when one of the opposites is predominant. Thus, the opposites are non-axiological, but in mixture they may manifest an excessive or deficient state which is axiologically negative because of bad blending.

It is now apparent how the structure of axiologically equal opposites is similar and different to the structure of non-axiological opposites. Like the ethical doctrine of the mean, non-axiological opposites make use of a third term, however the nature of this third term is quite different.

In the tripartite version of the doctrine of the mean the third term is *between* the two opposites and describes the desired or sought after behaviour between excess and deficiency. Although ethically unequal, the difference between the mean and the extremes is not ontological. Both the desired and undesired states are on the same 'level', as the use of physical metaphors makes apparent. The third term in theories that make use of non-axiological opposites, however, *is* ontologically distinct from the opposites that it unifies. The unifying principle is the 'unapparent connection', the underlying, distinct law which regulates manifest change, i.e. the succession of the dominion of the individual opposites.

The use of non-axiological opposites in physical theories, then, shows some limited similarities to how polarity was used in the ethical doctrine of the mean. When, however, the opposites in the doctrine of the mean become quantifiable, they cease to be axiologically negative, and become non-axiological. When this is the case, the doctrine of the mean (as uni-levelled) changes into a two or three levelled structure which employs non-axiological opposites, and an ontologically distinct blending principle.

There are also important parallels between non-axiological opposites and axiologically different opposites. In both conceptions, the opposites are discrete substances or forces. In mythological thinking, this, perhaps, was underscored by a tendency to anthropomorphize the opposites. In natural philosophy too there was a tendency to attribute certain human characteristics to the opposites in so far as they were warring with one another. This is especially apparent when the unifying principle was cast as a judge or even the principle of Justice itself. When a political metaphor is employed at the level of the unifying principle, it is easier to see how the opposites in the physical world were supposed to have human characteristics and be discrete.

There were, therefore, three very different conceptions of polarity in early Greek thought. On the one hand, some opposites were viewed as discrete and axiologically dissimilar, either ethically or ontologically, to one another, while on the other hand, in early ethical thought, there emerged the view that opposites (the extreme states) were equal in ethical significance: both were bad. Furthermore, other opposites were viewed as being non-axiological. In this latter case, a third ontologically distinct principle was required for their regulation.

(II) Expressions of Worth

As has been shown through the previous discussion, wherever opposites are invoked in Greek accounts of the world, some conception of value is present as well. This, as we have seen, is true in all three conceptions of polarity. With regard to non-axiological opposites, positive value was found in the proper regulation of the successive rules of opposed forces or elements. This regulatory principle was characterized differently, and called by different names (Time, Justice, Harmony, Logos, God, Zeus, Intelligence). Its purpose, however, was always the same: to account for and safeguard the uniformity of change in the physical world. Furthermore, when non-axiological opposites were used as the component parts of body, positive value was found when the opposites were mixed in due proportion or when there was the proper transmutation of one element into another. In all of these cases, then, the axiologically positive principle is ontologically different from the opposites. In the case of physical change, the proper regulation of the succession of opposites is maintained by an independent principle, and in the case of the composition of bodies, success (healthy, well-formed bodies) is achieved when the elements are mixed, blended, or transmuted according to due proportion, and what 'due proportion' usually meant was that the ratio of the elements was one of equality--*isonomia*. Although 'due proportion' is not often anthropomorphized (as is the regulating principle in theories of change), it is clearly a principle that is ontologically different from the opposites, and it is infused with positive worth, unlike the opposites themselves. I shall return to non-axiological opposites and the body in Chapter 4.

Furthermore, it has been shown how value was associated with axiologically equal opposites. Although both opposites (excess and deficiency) are given positive definitions or descriptions, they both have a negative worth. The axiologically positive state is found in between these two negative opposites, and is called *kairos* or *meson*--moderation. All three states--excess, deficiency, and the mean--are ontologically on a par. The mean, or positive state, is not a distinct principle, but instead is a kind of behaviour that is between the two extremes. This kind of polarity is found later in Aristotle's theory of virtue.

According to the *Nicomachean Ethics*, virtue is a mean (*mesotes*) between two extremes, an excess and deficiency.[55]

Value, both negative and positive, is also present in those contexts in which terms in a polarity were thought to be axiologically different. In those cases in which the difference was ethical, although the opposites again were both given a positive definition or description, positive worth was attributed to only one. Further, in appropriate contexts, one was supposed to strive for the positive term. This is perhaps most strikingly apparent in those cases in which the difference between the opposites was ontological. Parmenides and Plato both believed that one should strive for truth, the axiologically positive term in the pair truth/falsity. When the difference between opposites was ontological, however, not only was the negative term given a negative worth, but it was also defined negatively as the privation of Being (or form in the case of Aristotle).

Difficulties arise when one examines later uses of axiologically different opposites. Although it was the case that early uses of axiologically different opposites treated the terms not only as discrete, but also as not having any structural relationship with one another, by the time of Plato some philosophers were trying to use axiologically different opposites and some sort of reconciling principle to explain certain types of phenomena. Indeed, Plato himself did this in the *Republic* in his explication of the soul.[56]

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[55] Because of the plethora of scholarship on Aristotle's use of the mean in his ethical theory, I shall not consider it here in any detail. I shall, however, consider Aristotle's use of the mean in Chapter 3 and also other aspects of the *Nicomachean Ethics* in Chapter 7 (the formation and stability of character states). Excellent treatments of Aristotle's use of the ethical mean can be found in *Aristotle, Virtue and the Mean*, *Apeiron* 25 (eds. Richard Bosley, Roger A. Shiner and Janet D. Sisson), Edmonton (1995). Further, in this volume is an excellent list of other classic articles and books on this topic.

As we have seen, theories that employ non-axiological opposites require a principle which either regulates their successive rules or else mixes them in such a way that a positive state results. But in both of these cases the desired progression or blending was based on a principle of equality. In the case of change, the regulating principle was meant to safeguard, in the main, the equal domination of the opposed forces or opposites, and in the case of body, due proportion was characterized as an equal balance.

In a theory, however, that brought together opposites that were axiologically (ethically or ontologically) different, a principle of equality is not appropriate. The main reason for this is that in such theories, the overall desired positive state is characterized by a preponderance of the axiologically superior term, even though this superior term was mixed or thought to exist in some sort of structural relationship with the axiologically inferior term.

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[56] See my chapter on psychological harmony for a discussion of this.

It is my contention that the principle of *harmonia* was used in just such a situation. There are a number of reasons why it was appropriate. (1) Early uses of *harmonia* have political overtones. It can mean a political 'covenant' or 'agreement' of unequals, since political communities are inevitably made up of unequal elements or classes, e.g. ruler and ruled. (2) *Harmonia* in a musical context can mean either a mixing or blending of axiologically different or non-axiological opposites (depending on the context). (3) *Harmonia* as a blending of opposites is expressed by ratios that are non-isonomic (2:1, 3:2, 4:3), and so *harmonia* could easily have been viewed as the mathematical prototype of mixtures that were meant to have a preponderance of one of the terms. I shall illustrate and discuss these three points in the next chapter.

It has been shown that the use of polarity was ubiquitous in ancient Greek thought. There were, however, three different conceptions of polarity: non-axiological opposites, axiologically equal opposites and axiologically different opposites, and they were used in a variety of different contexts. In all three cases, value was present, but was exhibited in different ways.

In the next chapter I shall examine in detail one expression of value--*harmonia*. Used as both a regulating and blending principle, it found its way into use as a reconciling principle of both non-axiological and axiologically different opposites. Furthermore, insofar as musical *harmonia* employed the three means (geometric, harmonic and arithmetic), it also influenced axiologically equal opposites. It is to these ideas that I now turn.

Chapter 3

Harmonia and Number

Aristoxenus wrote in his treatise on Arithmetic that the Pythagoreans were the first to use number in a way that went beyond the needs of commerce.[1] Given Aristoxenus' statement, one might envision the Pythagoreans pursuing arithmetic as a purely abstract science--an absorbed mathematician or physicist scribbling down notes regarding the mathematical laws that govern physical phenomena. Although the Pythagoreans did pursue the study of number with the idea that number could describe the cosmos and some of its contents, their use of number was very different from our own. The Pythagoreans assigned numbers or ratios to many things, but these numbers were thought to have spatial magnitude. Number was used to symbolically designate the structure of other things (both physical and conceptual), and was also believed to actually underlie other things.

By means of an examination of Pythagorean ideas, it becomes apparent that there was one particular physical phenomenon that served as the model and inspiration for assigning number(s) to other things. This phenomenon was the correspondence between the musical concords and simple numerical ratios. These ratios and the numbers of which they were composed were privileged and normative. In the musical context, they described beautiful and pleasing phenomena. When these privileged ratios were applied in other areas, they were used similarly to signify positive states or structures.

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[1] See John Burnet's *Early Greek Philosophy*, Cleveland (1930): 99.

In this chapter I shall examine how number was introduced into discussions of worth. I shall begin by looking at the Pythagoreans' conception of number, and how they used number as a principle in the physical world. Then I shall turn more directly to an examination of the privileged ratios which made up musical *harmonia*. This examination will include how the Pythagoreans purportedly discovered these privileged ratios, their application in descriptions of the cosmos, and finally, the physical and mystical significance that was attributed to both the ratios and number. A discussion of musical *harmonia* shall follow in which I discuss both how *harmonia* acted as a reconciling principle, and what sort of opposites it was meant to unite or regulate. This shall be done by looking at both the earliest Pythagorean testimonia, as well as later Pythagorean ideas. As all that can be safely attributed to Pythagoras himself is a belief in metempsychosis and the use of musical *harmonia*, I shall be relying to a large degree on 5th and 4th century Pythagoreanism.

(I) Number and Ratio in Pythagorean Thought

(i) The Number of Things

Perhaps one of the most striking differences between the Pythagoreans' use of number and later uses is that the Pythagoreans treated number as having spatial magnitude, not as abstract units. Aristotle wrote the following of the early Pythagoreans:

> Now the Pythagoreans, also, believe in one kind of number--the mathematical; only they say that it is not separate but sensible substances are formed out of it. For they construct the whole universe out of number--only not numbers consisting of abstract units; they suppose the units to have spatial magnitude. (*Metaphysics* XIII 6, 1080b18)[2]

Numbers, according to the Pythagoreans, are part of the physical world. Numbers have spatial magnitude, and as such form the sensible substances of the world. They are somehow the building blocks of the universe.

John Burnet has written that numbers, when conceived as having spatial magnitude, come to be associated with shapes and structures: "[it] seems...that numbers were originally represented by dots arranged in symmetrical and easily recognized patterns, of which the marking of dice or dominoes gives us the best idea".[3] The Pythagoreans are reported as having represented numbers spatially by arranging pebbles in various ways. For example, the number 4 would have been represented by four pebbles arranged in a square; the number 3 would have been represented by three pebbles arranged in a triangle.[4] As such, numbers can be associated with other sensible substances in two ways: (1) number can represent other things by having a similar shape or structure, and (2) number can be the cause of something else being what it is, or being stable, or being organized in a particular way, because the number, and thus its structure, underlies and forms the sensible object. In other words because the structure of the number underlies the object, the number was thought to be the first principle of the object; the number made the object what it was in form.

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[2] Also see *Metaphysics* XIV 3, 1090a20-23 where Aristotle wrote "But the Pythagoreans, because they saw many attributes of numbers belonging to sensible bodies, supposed real things to be numbers--not separate number, however, but numbers of which real things consist".

According to Aristotle, it seems that the Pythagoreans thought that the relationship between number and sensible substance was of the latter sort--that number caused, not merely represented, sensible substance; that number was the first principle or perhaps *aitia* of sensible substance. This interpretation of the Pythagoreans' use of number gains further support from other testimonia. It seems, however, that the Pythagoreans believed number to be the *aitia* or principle of sensible substances because of the similarities they noticed between the structures of various numbers and the structures of other substances.

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[3] Burnet, p. 101.

[4] See Burnet, p. 101-104.

A scorned portrayal of how number was supposed to resemble and underlie physical substance is found in the testimonia relating to the early Pythagorean Eurytos. Aristotle wrote the following:

> This is how Eurytos decided what was the number of what (e.g. of man, or of horse), viz. by imitating the figures of living things with pebbles, as some people bring numbers into the forms of triangle or square.
> (*Metaphysics* XIV 5, 1092b10-14)

According to Aristotle, Eurytos arbitrarily assigned numbers to physical substances by arranging pebbles so that they corresponded to the physical (or perhaps symbolically important) characteristics of the substance. It seems that then the number of pebbles were counted, and this number was thought to cause (in almost the sense of a formal *aitia* but not entirely) and thus represent, the substance.

Other assignments of numbers to things appear less arbitrary.[5] According to Aristotle, three things--opportunity, justice and marriage--were often associated with number. He wrote, "...the Pythagoreans had before this treated of a few things, whose formulae (*tous logous*) they connected with numbers--e.g. opportunity (*kairos*), justice and marriage" (*Metaphysics* XIII 4, 1078b21). The Pythagoreans saw resemblances between these things and number.[6] For example, the number 7 was thought to resemble opportunity or 'season' (*kairos*) since "natural things seem to have their perfect seasons of birth and completion in terms of sevens"[7]: babies are born after seven months; their teeth begin to appear seven months after birth; puberty is reached at the end of two sets of seven years, manhood at the end of the third (F203, 38.19-20). Further, both the Sun and Athene were associated with the number seven. The Sun, holding the seventh place among the ten heavenly bodies, was thought to be the cause of the seasons, and was for these reasons identified with *kairos* and the number seven (F203, 38.21-39.3). Athene too was identified with the number seven. The association was explained as follows:

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[5] Although these other number assignments may seem less arbitrary, they no more correspond to modern mathematical thinking than does Eurytos' use of number.

[6] See also *Metaphysics* I 5, 985b26-30 where Aristotle wrote "in numbers [the Pythagoreans] seemed to see many resemblances to the things that exist and come into being--more than in fire and earth and water (such and such a modification of numbers being justice, another being soul and reason, another being opportunity--and similarly almost all other things being numerically expressible)".

[7] Aristotle Fragment 203, from Alexander *Commentarius in Metaphysica*, 38.18 as translated and found in Jonathan Barnes' *The Complete Works of Aristotle, Volume II*, Princeton (1984): 2443-2444. I shall hereafter refer to this fragment as F203.

> Since the number 7 neither generates nor is generated by any of the numbers in the decad, for this reason they also said that it was Athene. For the number 2 generates 4, 3 generates 9 and 6, 4 generates 8, and 5 generates 10, and 4, 6, 8, 9 and 10 are generated, but 7 neither generates any number nor is generated from any; and so too Athene was motherless and ever virgin. (F203, 39.3-9)

Thus, *kairos* or opportunity was associated with the number 7 because of the observation that the generation and actualization of many natural things occurred at the end of a period of seven months or years. Furthermore, the number 7 was associated with the Sun and Athene since there were similarities between their characteristics, or as Aristotle wrote, their *logous*.

Justice, too, was thought to have a number. Justice, having the properties of reciprocity and equality, was thought to bear a likeness to a square number. Aristotle is said to have wrote the following:

> ...the first square number was justice, for in every case the first of a number of things that admit of the same definition is most truly that which it is said to be. Now this number some declared to be the number 4, because, being the first square number, it is divided into equals and is itself equal (being twice 2), while others declared it to be

> the number 9, which is the first square number produced by multiplying an odd number (3) by itself. (F203, 38.12-17)

Again, we see that number was associated with something else because of shared characteristics.

Marriage was the number 5. It is the union of male and female, and according to the Pythagoreans, male was odd and female is even.[8] Since 5 is the number that is the union of the first odd and even number, i.e. 3 and 2, it is the number of marriage (F203, 39.9-12). Here too we see that the association of number has to do with structural similitude.

Furthermore, the Pythagoreans were thought to have associated the number 1 with Mind (since it is unchanging, homogeneous, and a ruling principle),[9] the number 2 with opinion (because it can "move in both directions"),[10] the number 3 with the whole of the universe (because it contains the beginning, middle and end),[11] and the number 10 with perfection.[12]

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[8] Walter Burkert, *Lore and Science and Ancient Pythagoreanism* (trans. Edwin L. Minar, Jr.) Massachusetts (1972): 34, originally published as *Weisheit und Wissenschaft: Studien zu Pythagoras, Philolaus und Platon*, Nurnberg (1962). Burkert wrote that even numbers are the feminine because even numbers have at their middle an empty space, capable of reception, whereas odd numbers have a middle member with procreative power.

[9] F203, 39.12-15. According to Aristotle, Plato too thought that Mind is the monad, but he assigned other things to the other numbers, e.g. knowledge is the dyad, opinion is the triad, sensation the tetrad. See *De Anima* I 2, 404b20-26.

[10] F203, 39.16-17.

Therefore the Pythagoreans, noticing certain structural and symbolic similarities between number and things in the world, assigned these numbers to the sensible objects. Moreover since, as Aristotle wrote, the Pythagoreans were brought up studying mathematics, they thought its principles were first principles.[13] Thus the numbers that were assigned to sensible objects did not merely represent these objects symbolically, but they were thought to be the first principles and elements of these objects. What this typically meant, as is evidenced from the above examples of number assignments, was that the structural aspect of a certain number was thought to be similar or identical to the structure of an object. This was evidence for the Pythagoreans that the number, as a positive structural principle (as would have been apparent in virtue of it being represented as having spatial magnitude) made the object what it was, since after all, number was the first principle. As Aristotle wrote,

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[11] Aristotle *De Caelo* I 1, 268a10-11 "For, as the Pythagoreans say, the universe and all that is in it is determined by the number three, since beginning, and middle and end give the number of the universe, and the number they give is the triad".

[12] See the Aristotelian *Problems* XV 3, 910b31-38, *Metaphysics* I 5, 986a7-8, and my discussion of the *tetraktys* of the decad later in this chapter.

[13] *Metaphysics* I 5, 985b25-27 and F203, 39.17-19.

> ...since, then, all other things seemed in their whole nature to be modelled after numbers, and numbers seemed to be the first things in the whole of nature, they supposed the elements of numbers to be the elements of all things.
> (*Metaphysics* I 5, 985b32-986a2)

(ii) The Ratios of Things

Up to this point I have been speaking about how the Pythagoreans used particular numbers. When viewed as having spatial magnitude, these particular numbers had characteristics that enabled them to be the models for, and causes of, other physical phenomena. The Pythagoreans, however, also used numerical ratios in the same way. They believed that certain ratios were privileged, and used them normatively to describe positive states or things in the cosmos that involved a relationship between two or more things.

As has been previously mentioned, the source of these privileged ratios was music theory. The Pythagoreans discovered (or at least popularized the idea) that underlying the pleasing concords in music were pure numerical ratios. The octave is comprised of the ratio 2:1, the fifth 3:2, and the fourth 4:3. Indeed, it was and is commonly thought that the discovery of these ratios which underlie the musical concords was the inspiration for assigning simple numbers to other things.[14]

There are many stories recorded of the discovery of these ratios, no doubt because of the extremely important role they played in Pythagorean philosophy. It is interesting, however, that in most of the stories, the various ways that Pythagoras himself or a Pythagorean purportedly discovered these ratios are based on physically false principles; it is extremely unlikely or impossible that the Pythagoreans discovered the ratios in any of the ways attributed to them. What this points to is that the mystical appreciation of the whole numbers played more of an a priori role for the Pythagoreans than some commentators allow. It is likely that the Pythagoreans were primarily concerned with the mystical and cosmic significance of these ratios and that they either knew about the ratios beforehand from some other source (quite possibly from practising musicians in that time), or else guessed at them by approximation, or if they did in fact discover them, that they were not concerned with replicating the discovery empirically.

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[14] See for example Aristotle's *Metaphysics* XIV 3, 1090a20-25 where he wrote that the reason why the Pythagoreans supposed real things to be numbers was because "the attributes of numbers are present in a musical scale...".

There are many examples of these 'discovery' stories. Nicomachus of Gerasa records that Pythagoras, already intent to discover what, if any, mathematical relationships held between the consonances in music, chanced to walk by a blacksmith's workshop. He heard the hammers beating iron on the anvil and giving out sounds that were concordant with one another, i.e. those consonances of the octave, the fifth and the fourth. Overcome with glee, he ran inside the smithy and performed a number of experiments, by means of which he discovered that it was the weight of the hammers that stood in direct relation to the difference in the sound. So, he weighed these hammers accurately and took away for his own use pieces of metal exactly equal in weight to the hammers. Once home, he hung from the ceiling four identical strings and attached a weight to the lower part of each string. Then he plucked the strings two at a time in turn, and found the concords previously mentioned, a different concord for each pairing.[15] Now, as Burkert has noticed, the physical law presupposed in the smithy's shop, that 'the vibration and sound of a metallic body are directly proportional to their volume and weight' is incorrect.[16] Furthermore, the presupposition that Pythagoras was working with in the second part of the story, that the frequency of vibration of a string is proportional to its tension, is equally false (Burkert, p. 376).[17] Therefore, the testimony of Nicomachus must be a romanticization of the tradition.[18]

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[15] Nicomachus of Gerasa, *Enchiridion* Chapter 6, 246.6-247.8, as translated by Andrew Barker in his *Greek Musical Writings, Volume II: Harmonic and Acoustic Theory*, Cambridge (1989): 247-269.

There are, however, other, more probable, stories about how these ratios were discovered. For example, according to Theon of Smyrna, Lasus of Hermione[19] and the followers of Hippasus used vases to determine the ratios underlying the basic consonances. Having acquired vessels entirely equal and alike, they filled up one of them half-way with liquid, and left the other empty. Then, by striking the vases, they obtained the consonance of the octave. Similarly, they obtained fifths and fourths by filling up the vases with amounts of liquid in the ratios 3:2 and 4:3.[20] Now, this would work only if the air in the vases were brought to a resonance; the strikings themselves would not produce the said consonances.[21] Thus, although this 'experiment' would not work as set out, it would produce the expected results if, for example, the vases had a small opening that allowed one to blow across the aperture.

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[16] Burkert, p. 375.

[17] Incidentally, the first person who recognized that most of the experiments attributed to Pythagoras were in fact wrong was Vincenzo Galilei, the father of Galileo. His discoveries led Galileo, and later Marin Mersenne to conduct more systematic experiments on the relationship between the tension of string and pitch. See Penelope Gouk's "The Harmonic Roots of Newtonian Science" in *Let Newton be!*, (eds. John Fauvel, Raymond Flood, Michael Shortland and Robin Wilson) Oxford (1988) p. 115.

[18] However, as Burkert has written, the legend does make a certain kind of sense. He writes, "The mythical inventors of smithcraft, the Idaen Dactyls, were regarded not only as wizards and founders of mystic rites, but also as the inventors of music" (p. 376). The *akousma* 'the sound of bronze when struck is the voice of a *daimon*' provides evidence that the connection between music and metal-working was contained in Pythagorean thinking. Thus, Burkert writes, the story that Pythagoras discovered the ratios underlying the musical consonances in a blacksmith's workshop "is a rationalization--physically false--of the tradition that Pythagoras knew the secret of magical music which was discovered by the mythical blacksmiths" (p. 377).

[19] According to Burkert, Lasus of Hermione, although never called a Pythagorean, was a 'close contemporary of Pythagoras' and "was doubtless among the earliest Greek musicologists" (Burkert, p. 378).

Also in this tradition is the story that Hippasus correlated the ratios of thicknesses of bronze discs to the musical consonances. Apparently, he made four bronze discs of equal diameter, with varying thicknesses; the second 4/3 times the first, the third 3/2 times the first, and the fourth twice the thickness of the first.[22]

What is more, there are stories that Pythagoras himself invented the monochord, which is a specialized musical device designed so that string lengths can be measured exactly in order to obtain the above ratios. It is unlikely, however, that the monochord was invented so early. As van der Waerden wrote, "The abundant theoretical music literature of the 4th century is entirely silent about such experiments: neither Archytas, Philolaus, Plato, Aristotle, Heracleides Pontikos nor Aristoxenus mention the 'canon'" (van der Waerden, p. 177). He concludes then, that the monochord was not invented until after Aristoxenus.

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[20] Adrastas, as quoted by Theon of Smyrna in *Mathematics Useful for Reading Plato*, 59.5-20, as translated by Barker, p. 218.

[21] See page 171 of B.L. van der Waerden's "Die Harmonielehre der Pythagoreer", in *Hermes* 78 (1943): 163-199. All passages taken from this article are my own translation.

[22] Scholia to Plato's *Phaedo* 108d4 (on the phrase '*Glaukou techne*', 'skill of Glaucus') (DK B18.12), as translated by Barker, p. 30-1.

Although it is unlikely that Pythagoras discovered the ratios underlying the musical consonances in any of the above ways that were attributed to him, there is evidence that the very early Pythagoreans knew about them, and attributed to them a cosmic significance. Indeed, both Burkert and van der Waerden believe that knowledge of these ratios was common among practising musicians of the day, but what distinguished the Pythagorean use of these ratios from the common one was precisely the cosmic significance that the Pythagoreans attributed to them.[23]

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[23] See van der Waerden, p. 172 where he wrote that the Pythagoreans, from the beginning, gained knowledge of the ratios underlying the octave, fifth and fourth from the sorts of experiences had by regular practising musicians. Van der Waerden cited the Aristotelian *Problems* XIX.23 and 50 as evidence for his claim. Burkert argued that there were both theories of sound and theories of acoustics among the Presocratics yet outside the Pythagorean circle. Further, he cited *Republic* 530d ff. as evidence that there were at least two distinct musical schools that recognized the ratios underlying the concords (although one was distinctly empirical). What then

It is likely, therefore, that the Pythagoreans were more concerned with the use to which they could put these ratios as a priori positive principles than with verifying the relationship between the concords and the ratios empirically. Like the physical characteristics of particular numbers, the musical concords provided the Pythagoreans with a model for describing other pleasing or positive phenomena. Similarities were seen to exist between the structure of these concords and the structure or workings of physical phenomena.

Perhaps the most famous example of the application of these musical ratios as a model for other pleasing arrangements is the Pythagorean belief that underlying the relations between the heavenly bodies are these same ratios. The ten cosmic bodies revolved around the centre of the universe at speeds proportionate to their distance, the

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distinguished the Pythagoreans from these other theorists was their "fundamental emphasis on number as such, which led to development of the mathematical theory of music quite beyond the requirements of actual practice" (Burkert p. 383). Thus, both van der Waerden and Burkert agree that although the Pythagoreans had knowledge of these ratios, their aim was not to reproduce these experiments, deriving from them a precise scientific collection of empirical data. Instead, freeing themselves from experience, the early Pythagoreans went on to speculate theoretically on the cosmic significance of these ratios. For the idea that the Pythagoreans weren't terribly concerned with appearances, nor did they feel terribly constrained by them, see Aristoxenus *Elementa Harmonika* II.xxxii.19-29, Aristotle *Metaphysics* 986a6-11, *De Caelo* 293a24-26, Aristotle Fragment 203, 40.21-33, Ptolemy, second extract: Porph. *Comm*. 23.23-24.6 (as translated by Barker, pp 240-241), Didymus, second extract: Porph. *Comm*. 27.17-28.26 (as translated by Barker, pp 243-244).

further from the centre, the faster their speed. These distances, and thus the bodies' speeds, were proportionate to each other. For example, the sun was twice as far from the earth as the moon, "Venus...three times as far, Mercury four times, and each of the others...in a certain ratio" (F203 40.4-5). These ratios were supposed to correspond to the privileged ratios as exemplified in music. This is shown by the fact that the arrangement of the heavenly bodies was called harmonious (presumably because the relationships between the bodies were supposed to correspond to the ratios found in a musical scale), as well as the fact that the Pythagoreans thought that by means of their movements, the planets produced notes that were in harmony with one another.[24]

Because number was the first principle in music, it was thought to be the first principle and cause of these other pleasing phenomena. This is shown by the following fragment attributed to Aristotle:

> But [the Pythagoreans] saw the harmonies to be constituted according to particular numbers, and said that numbers were the first principles of these also; the octave depends on the ratio 2:1, the fifth on the ratio 3:2, the fourth on the ratio 4:3. They said, too, that the whole universe is constructed in accordance with a certain harmony...because

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[24] See also *De Caelo* II.9.

> it consists of numbers and is constructed in accordance with number and harmony. (F203 39.20-25)[25]

Therefore, the Pythagoreans used these privileged ratios in the same way that they used simple numbers. Both number and these ratios had structural characteristics of their own which were thought to be similar to the structures of certain sensible substances and phenomena. These structures found in number and ratio were thought to characterize a positive state and were then used normatively to explain axiologically positive states, things or relationships in the cosmos.

It is thus easy to see what Burkert and van der Waerden meant when they said that the Pythagoreans gave a cosmic significance to number and ratio; the Pythagoreans used these ratios to account for the movement of the heavenly bodies. Before turning to a discussion of polarity and how these ratios acted as reconciling principles, I would like to discuss two things: the first is the notion of *harmonia* as a structure, and the second is the content of the cosmic significance of number and ratio in Pythagorean thought. In the fragments and passages that have been considered so far, *harmonia* has been used vaguely to signify the simple musical ratios. What has not emerged is the idea that *harmonia* is a system or structure which is made up of these ratios. Furthermore, while it is clear that number and ratio were privileged and were used normatively in explanations of the cosmos, it has yet to be determined what other positive attributes were associated with number and these ratios. I shall discuss these two points through an examination of the Pythagorean *tetraktys* of the decad.

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[25] See also *Metaphysics* I 5, 985b31-986a6 where Aristotle wrote the following: "...since, again, they saw that the attributes and the ratios of the musical scales were expressible in numbers; since, then, all other things seemed in their whole nature to be modelled after numbers, and numbers seemed to be the first things in the whole of nature, they supposed the elements of numbers to be the elements of all things, and the whole heaven to be a musical scale and a number. And all the properties of numbers and scales which they could show to agree with the attributes and parts and the whole arrangement of the heavens, they collected and fitted into their scheme...", and Aristotle F203 40.2-3: "...and since they said that number was the first principle of this harmony they naturally made number the first principle of the heavens and of the universe".

The significance attributed by the Pythagoreans to both individual numbers and the privileged ratios in music can be seen through an examination of the *tetraktys* of the decad. Sextus Empiricus records the following *akousma*, apparently by which the Pythagoreans swore: "No, by him that gave to us the *tetraktys*, which contains the fount and root of ever-flowing nature".[26] Sextus goes on to explain that the *tetraktys* is the most perfect of numbers, being the fitting together, the totality, of the first four numbers, i.e. ten, since 1+2+3+4=10.[27] As we have seen, the Pythagoreans imputed significance to each of the individual numbers lower than ten, for example, 1, 2, 3, 4, 5, 7 and 9. Furthermore, in the Aristotelian *Problems*, the author wondering why it is that all people, Greeks and barbarians alike, count up to ten, wrote:

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[26] See Sextus Empiricus *Adv. Math*. vii.94-95, as translated by Barker p. 30.

> Is it because ten is a perfect number? For it combines every kind of number, odd and even, square and cube, length and surface, prime and composite. Or is it because ten is the original number, since one, two, three and four together make ten? Or is it because the bodies which move in the heavens are nine in number? Or is it because in ten proportions four cubic numbers result, from which numbers the Pythagoreans declare that the whole universe is constituted? (*Problems* XV 3, 910b31-38)

Thus, the *tetraktys* not only is the fitting together of the first four numbers, which in themselves were significant to the Pythagoreans, but it includes every kind of number (odd and even, square and cube, length and surface, prime and composite). Further, the number 10 is a limit which serves to mark the upper extent of numbers that were particularly significant to the Pythagoreans.

As Sextus wrote, the *tetraktys* was also described as the 'fount of ever-flowing nature'. This was because, according to the Pythagoreans, the entire cosmos is organized on the basis of these numbers "according to

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[27] In later writings, the *tetraktys* was said to have been represented as an equilateral triangle, made up of pebbles or rocks. The pebbles were arranged in rows with different numbers of pebbles--one, two, three and four.

harmonia". *Harmonia* in this context designated a *systema* of the three most perfect concords, i.e the fourth, the fifth and the octave. The ratios of these three concords are found in the four numbers that make up the *tetraktys*, i.e. one, two, three and four, insofar as 2:1 underlies the octave, 3:2 underlies the perfect fifth, and 4:3 the perfect fourth.

As a *systema*, *harmonia* did not refer so much to the individual ratios or concords as to a whole unified structure which was made up of these ratios. This is shown explicitly in a fragment of Philolaus. According to Philolaus, *harmonia* was identified with the octave itself which was viewed as the whole:

> The magnitude of *harmonia* is the fourth and the fifth. The fifth is greater than the fourth by the ratio 9:8 [a tone]. For from the lowest tone to the middle string is a fourth, and from the middle string to the highest tone is a fifth, but from the highest tone to the third string is a fourth, and from the third string to the lowest tone is a fifth. That which is in between the third string and the middle string is the ratio 9:8, and the fourth has the ratio 4:3, the fifth 3:2, and the octave 2:1. Thus the *harmonia* is five 9:8 ratios and two *dieses*. The fifth is three 9:8 ratios and a *dieses*, and the fourth two 9:8 ratios and a *dieses*.[28]

The *harmonia* or octave can be understood as the ratio 2:1 (of string lengths, for example), but also as the combination of a fifth (3:2) and a fourth (4:3), a fourth and a fifth, two fourths and a tone (9:8), or five tones and two *dieses* (256:243). The following diagram illustrates this structure:

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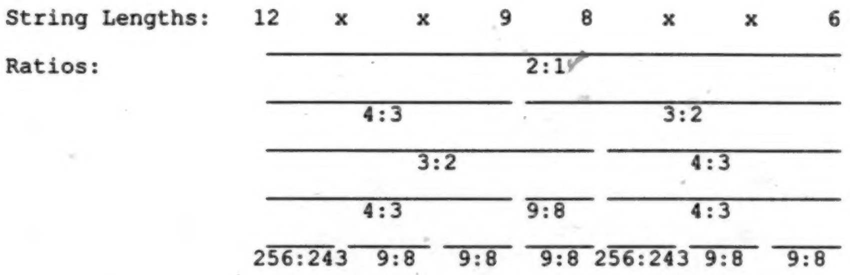
[28] Philolaus Fragment 6a, (Nicomachus, *Ench.* 252.17ff. (DK 44B6), as translated by Barker, p. 37-38, with a few changes (I have replaced the Greek technical musical terms with our own, e.g. instead of *syllaba*, I have written 'fourth').



Harmonia was thus meant to designate this entire structure. It is the fitting together not only of string lengths 12 and 6 in the ratio 2:1, but it is also the fitting together of smaller ratios, either those that underlie the perfect concords (3:2 and 4:3), or the even smaller ratios, one of which is generated from the difference between a fifth and a fourth (i.e. 9:8), and the other is what is left over when one divides the fourth by two 9:8 intervals. Thus, when Sextus wrote that the entire cosmos is organized on the basis of the numbers that make up the *tetraktys* "according to *harmonia*", what he meant was not only that the ratios that are found in musical *harmonia* were found in the cosmos, but also that the cosmos has in it the *structure* of *harmonia*.

Because the *tetraktys* is linked to *harmonia* in this way, we can see how the *tetraktys* was meant to stand for, or symbolize, the idea of *harmonia*. The *tetraktys* was (at least in part) the symbolic/geometric representation of the numbers that made up the basic consonances in music, which are found structurally in the idea of *harmonia*. What is more, the individual numbers 1, 2, 3, and 4 were also significant to the Pythagoreans since they each intrinsically were structurally similar to phenomena in the physical world. Thus, in the *tetraktys* of the decad we see how the cosmic significance of the simple numbers and the simple ratios were related to one another.

Preserved by Iamblichus is another *akousma* which purportedly goes back even earlier than the one recorded by Sextus. It reads: "What is the oracle at Delphi? The *tetraktys*: which is the *harmonia* in which the Sirens sing".[29] This passage again links together the ideas of the *tetraktys* and *harmonia*, as well as the Sirens, those mythical, sinister 'bird-women' whose song was supposed to have been so beautiful that passing travellers were enchanted, and subsequently wasted away, not caring to eat or sleep.[30] What the Sirens promised through their songs was knowledge, which is why, presumably, they are associated with the Delphic Oracle. For example, they sang to Odysseus the following:

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[29] Iamblichus *Vita Pythagorae* 82 (DK 58C4), trans. KRS p. 232.

> Come near, much-praised Odysseus, the Achaians' great glory;/ Bring your ship in, so you may listen to our voice./ No one ever yet sped past this place in a black ship/ Before he listened to the honey-toned voice from our mouths,/ And then he went off delighted and knowing more things./ For we know all the many things that in broad Troy/ The Argives and the Trojans suffered at the will of the gods./ We know all that comes to be on the much-nourished earth.[31]

Thus it appears that the *tetraktys* and *harmonia* were associated with these divinities and, through them, knowledge.[32] The cosmic and epistemological significance of *harmonia* appears again later in Plato's Myth of Er. In the *Republic*, eight Sirens each utter one note as they are carried around on the cosmic 'circles', and together make up a concordance. With them are "three others", the daughters of Necessity, and the Fates, who sing to the music of the

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[30] See Robert Graves' *The Greek Myths* Volume Two, Pelican (1960): p. 249.

[31] Homer's *Odyssey* XII, 184-191, as translated by Albert Cook in *Homer/ The Odyssey*, New York (1967).

[32] One tradition has it that the Sirens' songs were countered by the even lovelier music of Orpheus' lyre. They "lost their wings as a result of an unsuccessful singing contest with the Muses", and then committed suicide because of their inability to charm Orpheus. See Robert Graves' *The Greek Myths* Volume Two, Pelican (1960): 245. Given the connection between Pythagoras and Orpheus, this story is interesting.

Sirens, one of the past, one of the present and one of the future.[33]

The link between *harmonia* and knowledge is also found in the following passage from Iamblichus:

> What is the wisest? Number; but second, the man who assigned names to things. What is the wisest of the things in our power? Medicine. What is the finest? *Harmonia*. What is the most powerful? Knowledge.
> (DK 58C4, trans. KRS p. 232)

We see in this passage the idea that number is linked to knowledge or wisdom and that knowledge is the most powerful thing, and that *harmonia* is the finest. Since *harmonia* is also linked with number elsewhere, it is probable that it too is associated with wisdom and power.

Therefore, the cosmic significance of number and ratio in Pythagorean thought went beyond the idea that the cosmos was composed of number and ratio. As was illustrated through an examination of the *tetraktys*, these numbers and ratios were also linked with knowledge, mysticism and the divine. Furthermore, it has been shown that according to the Pythagoreans, *harmonia* referred to a particular structure. As such it was similar to the structures of individual numbers (it could be represented geometrically), and was thus linked to them. Individual numbers were thought to be structurally similar to the things that they composed, e.g. justice and marriage. Similarly, *harmonia* was thought to bear a structural resemblance to the cosmos. These normative structures were thus mathematically parsimonious, they were stable, aesthetically beautiful and widely applicable.

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[33] *Republic* 617b-c.

(II) *Harmonia* as a Reconciling Principle in Polarity

We have seen how number and worth are related in the thought of the Pythagoreans. Both number and ratio were axiologically loaded concepts which contained within them certain mystical, epistemological and other positive connotations. These numbers and ratios were believed to be the cause of other pleasing arrangements and axiologically positive states. We must now determine how the Pythagoreans' association of number and axiologically positive states linked up to pre-existing discussions of worth in descriptions of the physical world. As was illustrated in chapter 2, there were three different conceptions of polarity in ancient Greek thought: in different contexts, opposites were viewed as non-axiological, axiologically equal to or axiologically different from one another. Positive worth was present in all three conceptions of polarity. The way that worth was expressed and where it was found was different in each case.

In the context of non-axiological opposites, positive value was expressed in a third, ontologically different principle when it regulated the successive rules of the opposites, or unified them properly. Opposites that were axiologically equal--in the context of the early doctrine of the mean--were both viewed as negative. The positive state in this model was found in between the opposites in a mean. Value was also present in opposites that were viewed as axiologically different from each other. One term of the pair was viewed as ethically or ontologically superior to the other. The terms in this sort of polarity were discrete, and were structurally separate; they were antitheses whose function was to divide up the world into the categories of good and bad, positive and negative.

In what follows, I would like to examine how *harmonia* functioned as a reconciling and unifying principle in each of these three kinds of polarity. Not only was *harmonia* used as that principle which was meant to unify non-axiological opposites and axiologically equal opposites, but it was also used in contexts where the opposites were axiologically different. It is, perhaps, this latter use that is the most striking application of the principle of *harmonia*.

As was mentioned in chapter 2, by the 5th century some philosophers were trying to use axiologically different opposites and some sort of reconciling principle to explain certain types of phenomena, but the pre-existing models of reconciliation were not fit for the task since they were based on a principle of balance or equality (isonomic ratio). The reconciliation or unification of axiologically different opposites required some sort of principle that brought them into a stable relationship, yet allowed for the preponderance of the axiologically superior term.

Harmonia was perhaps uniquely suited to be this sort of principle. There are two meanings of *harmonia* in the ancient texts that are relevant to this use: one is a political meaning, and the other, as we have already seen, is musical. Both meanings of *harmonia* have within them elements which make *harmonia* an appropriate principle for the reconciliation of all three kinds of opposites, but in particular, axiologically different opposites. As shall be illustrated in the following, political *harmonia* meant the bringing together of, or unanimity between, both political equals *and unequals*. A political covenant or agreement--

which is the political meaning of *harmonia*--can be between either citizens of the same rank or status, or citizens with different rank. What is more, musical *harmonia*, as well as being understood as the bringing together of the high and low (which are non-axiological), was also conceived as being the bringing together of axiologically different opposites. This perhaps is most apparent in the writings of Aristotle, where it is clear that the middle note in a scale was thought to be prior in arrangement and to be the ruler of the scale. Furthermore, because musical *harmonia* is comprised of non-isonomic ratios, i.e. ratios that are made up of numbers that are not equal to one another (e.g. 2:1, 3:2, 4:3), musical *harmonia* could serve as the model for the reconciliation or unification of opposites where the goal indeed was a union, but a union in which one of the opposites was predominant.

I shall illustrate these points in the following by elucidating both the political and musical meanings of *harmonia* so as to show how *harmonia* was meant to act as these reconciling principles of opposites. I shall begin by looking at *harmonia* and non-axiological and axiologically equal opposites, and then I shall discuss the use of *harmonia* as a reconciling principle in axiologically different opposites.

(i) *Harmonia* and Opposites with Equal or No Value

As shall be illustrated in Section II of this thesis, many authors used *harmonia* as a principle which was meant to unify or regulate balanced or equal opposites. The opposites involved in this sort of model, though at times axiologically equal, were more often viewed as non-axiological. There is a precedent for using *harmonia* in this way even as far back as Homer. In many early uses of *harmonia*, the idea was that two things were brought together, and these things were distinct, separate and had no particular worth or value attributed to them.

The first surviving uses of *harmonia* and its verb form *harmozo* are found in Homer. In the *Odyssey* (V.248) we find the following:

> Meanwhile, the divine goddess Calypso brought along augers, and [Odysseus] then bored [all the beams] and fitted them to one another, [*harmoniesin arassen*]. Then he made it fast with pegs and with fastenings.[34]

Further, he wrote at V.361 that "...so long as the beams are fitted to their fastenings [*en harmoniesin arere*], I will stay here..." (trans. Cook). Thus, a meaning emerges here of a physical 'fitting together' as of boards in the building of a raft, a 'means of joining'. This sense of *harmozo* is also found in a noun form (*harmonia*) meaning 'a joint' or 'seam'. Herodotus wrote in the *Histories* (2.96) the following: "The boats have no ribs and [the seams (*tas harmonias*)] are caulked from inside with papyrus".[35] This meaning is also found in Pausanius' *Description of Greece* where he writes "For stones break and are dislodged *from their fittings* [*ek ton harmonion*]..." (8.8.8) and later "A large and strong ivy-tree grew over it, loosening the stones *from their joints* [*ek ton harmonion*] and tearing them apart" (9.33.7).[36] Thus the meaning here is either, actively, a fitting together of two boards as in the making of a raft, or as a noun, a seam or contiguous space where two distinct things, in these cases either boards or rocks, are joined.

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[34] Translated by Albert Cook in *Homer/ The Odyssey*, New York (1967).

Harmonia belongs to a larger group of words which share the etymon *ar* or *har*. Lippman wrote that "*ar* or *har* enters a great variety of verbs in the Indo-European languages, signifying the unification of disparate or conflicting elements into an ordered whole".[37] We have seen Homer's use of the cognates of *har*, yet he also uses *ararisko*,[38] *aresko*,[39] and *arasso* to mean 'connect', 'adapt, reconcile, satisfy', and 'slam together, and play the lyre' respectively. Thus, the meaning of these words emerges as either a transitive fitting together, or an intransitive adaptation.

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[35] Translated by Aubrey de Selincourt in *Herodotus: The Histories* (revised) London (1972): 164.

[36] Translated by W.H.S. Jones in *Pausanius: Description of Greece* Volumes III and IV, The Loeb Classical Library, London (Vol. III: 1933, Vol. IV: 1935).

As is apparent most clearly in the passages from Homer and Pausanius, *harmonia* was the fitting together of things that are not axiologically superior or inferior to one another. The boards which make up Odysseus' raft are distinct separate things and they are non-axiological. The same is true of stones in a wall. It is also the case, however, that this early conception of *harmonia* could easily accommodate the bringing together of axiologically equal opposites. This is true in both the transitive and intransitive meanings of *harmonia*. There is nothing in the conception of a transitive fitting together that excludes the possibility that the opposites have some value attached to them. Moreover, those meanings of *harmonia* that have political overtones, e.g. reconcile, etc., could apply equally well to both non-axiological opposites, and axiological equal opposites (and, as I shall discuss presently, axiologically different opposites).

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[37] Edwin Lippman, *Musical Thought in Ancient Greece* New York (1964): 3.

[38] See for example Homer's *Iliad*, 1.136, 12.105, 14.167, 16.211, and 16.214, and the *Odyssey* at 2.289, 4.777, 5.248, 21.45.

[39] See the *Iliad* 4.362, 9.112, 9.120 19.179 and the *Odyssey* 8.396, 8.402, 22.55

Given these early meanings of *harmonia*, the Greeks had good reason for using it as a principle which fitted or brought together or reconciled non-axiological or axiologically equal opposites. There was a preexisting tradition and meaning of *harmonia* that made it appropriate for the task.

There is also a conception of musical *harmonia* in which the opposites that were unified were viewed as non-axiological. The opposites in this conception are the high and the low, the loud and the soft, the short and the long. For example, in *De Anima* Aristotle wrote that concords always imply a ratio of the high to the low,[40] and in *On the Universe*, the author wrote that "music...mingling together notes, high and low, short and prolonged, attains to a single harmony amid different voices" (*On the Universe* 396b15-16). While this is a simpler conception of *harmonia* than that found in Philolaus (in that it makes no explicit use of number), it does show that *harmonia* in music was also conceived as simply the fitting together of two notes which had different characteristics. Therefore, there was a model even in music in which *harmonia* was a principle that reconciled non-axiological opposites.[41]

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[40] See *De Anima* III 2, 426a27-b3.

(ii) *Harmonia* and Axiologically Different Opposites

As was mentioned in the introduction to this section, there are three aspects of *harmonia* that make it suitable as a reconciling principle for axiologically different opposites: (1) it is connected with political unanimity, which can be the agreement of different people or classes that have different ranks, (2) musical *harmonia* can be viewed as the bringing together of axiologically different opposites, and (3) musical *harmonia* is made up of non-isonomic ratios, and so it could easily have been viewed as the prototype of unifications or reconciliations of opposites that were meant to have a preponderance of one of the terms. I shall illustrate the political connection first, and then treat the second and third aspects of musical *harmonia* jointly, as they are intimately connected.

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[41] And also axiologically equal opposites. See footnote 49 in this chapter.

Although, as we have seen, the early literal meaning of *harmonia* is an active 'fitting together' of physical things, even in Homer there is a metaphorical usage. In the *Iliad* (22.255), Homer uses the noun form, *harmonia*, to mean a political covenant or agreement (and this would be related, no doubt, to its intransitive meaning 'to reconcile'). This political meaning of *harmonia* is found in classical times as well. For example, Plato uses this political meaning of *harmonia* frequently. The meaning behind his use (in the context of defining moderation) is a unanimous agreement of disparate parts as to who should rule and who should be ruled. This sort of harmony makes each part "sing the same tune" (*Republic* 432a).[42] As is explicit in Plato, *harmonia* is meant to reconcile axiologically different parts. In the city these parts are the ruler, the guardian class and the craftsmen; in the soul it is the rational, spirited and appetitive parts of the soul.

While it is true that political covenants and agreements can exist between axiologically equal or non-axiological groups, it is also true that they can exist between axiologically different groups. Indeed, more often than not, in political systems what must be reconciled or brought together are those parts that are unequal. Thus, *harmonia* with these political overtones could easily have been viewed as a reconciling or unifying principle of axiologically different opposites.

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[42] See Chapter 5 on psychological *harmonia* for further discussion of Plato's use of political *harmonia*.

We find a use of *harmonia* in the fragments of Philolaus that seems to suggest the reconciliation of axiologically different opposites. As we have seen, Philolaus gave to *harmonia* a precise musical meaning in Fragment 6a. *Harmonia* also, however, served as a cosmological principle in his thought. According to Philolaus there are three principles which explain nature: limiters, unlimiteds and *harmonia*. Limiters and unlimiteds are 'locked together' by the principle of *harmonia*: "Nature in the universe was harmonised from unlimiteds and limiters, both the whole universe and all things in it" (DK B1, trans. Barker, p.36).

What is interesting in Philolaus' use of *harmonia* in this cosmological context is that he appears to believe that the limiters and unlimiteds are axiologically different from one another. Evidence for the axiological dissimilarity of these two principles comes from three different sources: (1) the testimony of Aristotle, (2) Philolaus's Fragment 6, and (3) Philolaus' use of *harmonia* in the musical context.

As we saw in Chapter 2, Aristotle wrote in the *Metaphysics* that the Pythagoreans purportedly thought that there were ten principles, which they arranged in two columns. In one column they placed limit, odd, one, right, male, resting, straight, light, good and square; in the other column were their opposites: unlimited, even, plurality, left, female, moving, curved, darkness, bad and oblong.[43] These pairs of opposites clearly were viewed as antitheses in which one term was, in some way, axiologically superior to the other; in each column were grouped those principles that were similar to each other with respect to their value, one column being comprised of positive principles, and the other column of negative principles. Thus, there is evidence that some early Pythagoreans believed the limited and unlimited (or perhaps, limiters and unlimiteds) to be axiologically different. While it is true that we cannot be sure that Aristotle was referring to Philolaus's ideas in this passage from the *Metaphysics*, if these columns did originate with the Pythagoreans, then it is unlikely that Philolaus would have believed something entirely different.

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[43] *Metaphysics* I 5, 986a22-26.

Further evidence that Philolaus's principles of limiters and unlimiteds were axiologically different comes from Fragment 6:

> And since there existed these principles [limiters and unlimiteds], being neither alike nor of the same race, it would then have been impossible for them to be organised together, if *harmonia* had not come upon them, in whatever way it arose. The things that were alike and of the same race had no need of *harmonia* as well; but things that were unlike and not of the same race nor equal in rank [*mede isotage*], for such things it was necessary to have been locked together by *harmonia*, if they were to be held together in a cosmos. (DK B6, trans. Barker, p.37)

Things that are alike, of the same race, and equal to one another have no need for *harmonia*. *Harmonia* instead was thought to be a principle that united limiters and unlimiteds--principles that were unequal to each other in some way. Indeed, in this passage we find the idea that limiters and unlimiteds are not 'equal in rank' (*isotage*).

Finally, Philolaus's use of *harmonia* in his discussion of the octave structure also seems to point to the use of axiologically different opposites. In music, what are brought together are the high and the low, opposites that are, at least on one level, non-axiological. These are manifest in, for example, two strings of differing lengths. The length of each string is expressible by a number, and as I shall argue in Chapter 6, it was theoretically important to the Pythagoreans that one of these numbers be even, and the other odd. As we have seen from Aristotle's testimony, the odd and the even were significant to the Pythagoreans; indeed, they too are found in the two columns as described in the *Metaphysics*. Further, the odd and the even, as principles, are remarked upon by Philolaus in other fragments (DK B4 and B5).

What these details point to is that it may have been the case that Philolaus believed the odd and even in music to be specific examples of the more general cosmic principles of limiters and unlimiteds. If this is so, then in the case of musical *harmonia*, the opposites were meant to be axiologically different as well.[44]

Furthermore, as has already been mentioned, *harmonia* for Philolaus was a structure which was comprised of non-isonomic ratios (i.e. 2:1, and the fitting together of the smaller ratios 3:2, 4:3, 9:8 and 256:243). As such, it could serve as a model for the unification of opposites in which the resultant structure had a preponderance of one of the two terms. If it was the case that the opposites in the case of music were, for Philolaus, axiologically different, then we have here the first example of opposites with differing value being brought together by means of non-isonomic ratios, i.e. in which the axiologically superior term was perhaps believed to predominate.

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[44] I shall argue something similar to this in Chapter 6.

In other authors, however, the idea that what are brought together in the case of music are axiologically different is unmistakable. For example, in Aristotle's thought, the elements which are brought together are not only unequal, but this inequality is characterized in terms of ruler and ruled. We can see this in a passage from the *Politics*:

> And there are many kinds both of rulers and subjects...; for in all things which form a composite whole and which are made up of parts, whether continuous or discrete, a distinction between the ruling and the subject comes to light. Such a duality exists in living creatures, originating in nature as a whole; even in things which have no life there is a ruling principle, as in a musical mode.
> (*Politics* I 5, 1254a24-33)

What is striking in this passage is that Aristotle thinks that musical modes have within them a ruling and ruled part. Indeed, he writes that 'in all things which form a composite whole out of parts' there is a ruler and a subject. This is true not only of animate things, but also of inanimate things, and he cites as his example the musical modes.

What Aristotle meant when he said that within a musical mode or scale there is a ruling and a ruled part is made clearer in passages from the *Problems* and the *Metaphysics*.

Aristotle believed that the middle note in a scale, *mese*,[45] is the leader of a scale (what we might call the tonic of a scale), and is prior in arrangement to the other notes in a scale. That *mese* was conceived as the leader or tonic in a scale is brought out in the following passage:

> Why is it more satisfactory to pass from a high to a low note than from a low to a high note? Is it because the former amounts to beginning at the beginning, for the *mese*, or leader, is the highest note in the tetrachord? But in passing from a low to a high note one begins not at the beginning but at the end. Or is it because a low note is nobler and more euphonious after a high note?
> (*Problems* XIX.33)

Mese, according to this passage, should be the leader or beginning of a melodic line. Indeed, in *Problems* XIX.20 it is written that "in all good music *mese* occurs frequently, and all good composers have frequent recourse to *mese*, and, if they leave it, they soon return to it, as they do to no other note...". Therefore, it appears that *mese* was conceived as the leader in melodies. Not only should it be temporarily prior to lower notes, but the composer should return to it often.

Mese was also thought to be prior in arrangement to the other notes in a scale. According to both the *Problems* and the *Metaphysics*, all the other notes in a scale were tuned from *mese*, and thus, it was *mese* that held them all together. In the *Problems*, the author, wondering why it is that the alteration of *mese* spoils the tuning of the whole scale, whereas the alteration of any of the other notes spoils the tuning of that note alone, wrote the following:

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[45] *Mese* was the name given to the top note of the first tetrachord, string length 9 in the diagram on page 99. String length 8 would have been called *paramese*. Why *mese* was so-called when it wasn't really the middle of the octave is a question which was taken up in the *Problems*. The author wrote that "Is it because in the old days scales had seven notes, and seven has a middle?" (*Problems* XIX.25). See also *Problems* XIX.44.

> Is it because for all strings being in tune means standing in a certain relation to *mese*, and the arrangement of each is already determined by *mese*? If, therefore, that which is the cause of their being in tune and which holds them together is taken away, their proper relationship appears to be no longer maintained. But if one string is out of tune but *mese* is not altered, naturally the defect lies in that string only; for all the others are in tune.
> (*Problems* XIX.36)

In the *Metaphysics* Aristotle wrote that *mese* is the *arche* of the arrangement of a scale. *Mese* is that note which is originally fixed, and from it all other notes are arranged according to some rule or principle:

> ...Others are prior in arrangement; these are the things that are placed at certain intervals in reference to some one definite thing according to some rule, i.e. the second member of the chorus is prior to the third, and the second-lowest string is prior to the lowest; for in the one case the leader and in the other the middle string (*mese*) is the beginning (*arche*). (*Metaphysics* V 11, 1018b26-29)

Mese is definite. From it all the other notes are placed 'at certain intervals', 'according to some rule'. What this 'rule' presumably is, is the principle of *harmonia*.

Thus it appears that musical *harmonia*, conceived as a structure, had within it one element that was thought to be prior or more fundamental both temporary and structurally to the other elements. There was a natural ruler and ruled. The ruler was the middle or mean, and the ruled were the extremes and the notes in between the mean and these extremes. Furthermore, as was evident in *Problems* XIX.36, the mean was thought to hold together these other elements in the structure.

We see the idea that the mean or middle is some sort of leader and the preserver of the whole in Plato as well. In the *Epinomis* is the following passage:

> ...why, in the potency of the mean between these terms [6,12], with its double sense, we have a gift from the blessed choir of the Muses to which Mankind owes the boon of the play of consonance and measure, with all they contribute to rhythm and melody. (*Epinomis* 991b)

Although unquestionably obscure, this passage contains the idea that the two means in music, the harmonic (which describes *mese*) and arithmetic (which describes *paramese*), have a potency (*dunamis*) which engenders both consonance and measure. The 'double sense' of this potency could very well refer to the fact that from each (*mese* and *paramese*) the tuning of both what is above and below can be determined.

Furthermore, in the *Republic*, we see Plato assigning to the middle parts of both the city and the soul the role of preserver. At *Republic* 429c Plato wrote the following:

> ...courage is a kind of preservation...the preservation of the belief which has been inculcated by the law through

> one's education as to what things and what kinds of things are to be feared, and by always I meant to preserve this belief and not to lose it when one is in pain, beset by pleasures and desires, and by fears.[46]

Even though the rational part of the soul is thought to be the ruler, the *dunamis* of the middle part--the spirited part--is the preservation of the whole.[47]

From this examination of the use of *harmonia* the following points have emerged. (1) Prior to the Pythagorean cosmic use of *harmonia* there was a political meaning of *harmonia* which suggested that it could be used as a principle of reconciliation between axiologically different groups. (2) Musical *harmonia* as conceived by Philolaus was a unified structure which was made up of non-isonomic ratios. Because *harmonia* was not based on a principle of equality, it could be used as a model for bringing together opposites or elements in such a way that the quantity of the superior term was greater than the quantity of the inferior term. (3) *Harmonia* when used as a principle of reconciliation in music was in some contexts thought to bring together axiologically different opposites. In the thought of Philolaus, it may have been the case that the even and odd, as axiologically different, were brought together by means of these harmonic ratios, as specific manifestations of the two more general principles, limiters and unlimiteds.[48] In Plato and Aristotle, the idea clearly emerges that musical *harmonia* is supposed to bring together axiologically different opposites that are characterized in terms of ruler and ruled. In musical scales, *mese* was thought to be the ruler of, and prior in arrangement to, the other notes. Furthermore, because *mese* was structurally prior to the other notes, it was thought to hold together and preserve the entire structure.

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[46] Translated by G.M.A. Grube in *Plato's Republic* Indianapolis (1974). All passages taken from the *Republic* are Grube's translation.

[47] See also *Phaedo* 92e-93a, 94b-95a for Plato's discussion of whether *harmonia* directs the elements within it, or whether they direct the *harmonia* and my discussion of these passages in Chapter 5. Also relevant to this point is *De Anima* I 4, 407b35 where Aristotle considers

Because *harmonia* was conceived in this way, it could serve as a model for the reconciliation of axiologically different opposites and elements in many other areas of thought. Not only could it unify or reconcile opposites that were different from one another in their ethical or ontological worth, but it could also serve to reconcile

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whether or not the power of originating movement can belong to a *harmonia*.

[48] For a more detailed discussion of Philolaus' use of limiters and unlimiteds in music, see Chapter 6 on cosmological *harmonia*.

elements of which the difference was characterized in terms of ruler and ruled.[49]

In conclusion, it has been shown that the Pythagoreans, noticing certain structural similarities between number and things in the world, assigned these numbers to them. When viewed as having spatial magnitude, these numbers had characteristics that enabled them to be the models for, and causes of, other physical phenomena. These numbers did not merely symbolically represent these things, but indeed, were their first principles and elements; number was thought to underlie sensible substances and be their cause.

The Pythagoreans used numerical ratios in the same way. They believed that certain ratios (i.e. 2:1, 3:2, 4:3) were privileged, and used them normatively to describe positive states or things in the cosmos that involved a relationship between two or more things. We saw an example of this in a description of the planets, and in the next section, we shall see these ratios employed in embryology, theories of perception, accounts of the soul, and in Plato's cosmological account in the *Timaeus*.

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[49] Although the early doctrine of the mean did not make use of any ontologically distinct principle, and so the principle of *harmonia* has no obvious place in this sort of model, there is an aspect of ancient music theory that is relevant to this model. As we saw in the above discussion of how *harmonia* could reconcile axiologically different opposites, the middle note in a scale was, at least in some contexts, thought to be axiologically superior to the other notes, both the extremes, and the intermediate notes between *mese* and the extremes. It was thought to be prior in arrangement, and the leader or tonic in melodic lines (see *Problems* XIX.44 where the author wrote that "of the points which fall between extremes the middle alone forms a kind of starting-point"). *Mese*, so conceived, is axiologically dissimilar to the other notes, but it is ontologically equal; they are all notes that make up a scale. Thus, like the mean in ethics, the note *mese* is inbetween the two extremes, and it, as a positive item, is on the same level as the axiological items that are negative. How the 'mean' in music affected the mean in ethics is a question that cannot be adequately answered here. Suffice it to say that because the mean in music contained a numerical aspect, any evidence that the mean in ethics was numericized should be considered with this backdrop.

The source of these ratios was music theory. The Pythagoreans used the correspondence between specific whole number ratios and the musical concords as the basis for assigning these ratios to other pleasing phenomena. As has been shown, it is likely that this use was an a priori one, and that they were not so much concerned with verifying the correspondence, as with the cosmic and mystical significance that they could give to these ratios. This cosmic and mystical significance had within it epistemological overtones, as well as associations with the divine.

These privileged ratios made up musical *harmonia* in the thought of Philolaus. *Harmonia* was the name for a structure which was made up of these ratios. As such it was the bringing together, or reconciling principle, of both the high and the low, as well as smaller ratios which, when fitted together properly, made up the larger concord of the octave.

In virtue of this musical meaning of *harmonia*, as well as pre-existing earlier meanings (e.g. both a general 'fitting together', as well as a political 'covenant' or 'reconciliation'), *harmonia* came to be used as a reconciling principle of opposites. As we saw in the last chapter, there were three different ways that the Greeks conceived of polarities: as non-axiological, as axiologically equal, and as axiologically different from one another. Because of the various meanings of *harmonia*, it could be used as a reconciling principle in all three kinds of opposites.

Most strikingly, however, *harmonia* was used as a principle that reconciled axiologically different opposites. The appropriateness of this use of *harmonia* can be understood by examining two aspects of its meaning. The political sense of *harmonia*, which can be interpreted as the bringing together of axiologically different political groups or classes, brought to the concept of *harmonia* a model for this sort of reconciliation. Moreover, the musical sense of *harmonia* provided a model in which unequal (i.e. non-isonomic) whole numbers were brought together with the result of pleasing phenomena. There was thus, for the first time, a numerical basis for the unification of things in which one term was preponderant. What is more, as we saw in the writings of Aristotle, even in music, the opposites brought together by *harmonia* were not always thought to be non-axiological. Indeed, Aristotle and Plato too believed that in a scale was a natural ruler and ruled.

Therefore, in Pythagorean thought, not only was it the case that number was privileged, but ratios too were believed to be normative causal principles. As codified in the principle of *harmonia*, these ratios were then used as the basis and/or paradigm for bringing together, and assigning numbers to, many other states, things and relationships.

SECTION II

In Section I, I illustrated how the ideas of polarity, *harmonia* and number came to be connected in the minds of the Greeks. Especially in the cases of axiologically equal and non-axiological opposites, there was a need for a principle that contained the ideas of measure, balance, stability and beauty. The Pythagoreans, by popularizing the knowledge that underlying one sort of opposition were simple numerical ratios, opened the door for others to use the principle of *harmonia* as that reconciling law which defines positive mean states and regulates change in the physical world. By choosing *harmonia* as this principle over other reconciling or regulating laws (e.g. Justice, *logos*, etc.), thinkers were able to import the stability of numerical relationships into the ever-changing physical world, thus giving it some enduring, albeit invisible, qualities.

There are, however, many questions about polarity, *harmonia* and number that remain to be addressed. We have seen that polarity was ubiquitous in ancient Greek thought. We have also seen that there are different conceptions of opposites in Greek thinking. *Harmonia* was used as a principle of reconciliation in many instances of these conceptions of polarity. This section of my thesis will illustrate this point by examining the different uses to which the Greeks put *harmonia* in different areas of inquiry.

Furthermore, there is a question about how the Greeks viewed musical *harmonia*, whether they literally believed that the ratios that underlie musical *harmonia* underlie other pleasing phenomena, or whether they were using musical *harmonia* as a theoretical analogue or metaphor in the other contexts.

This section of my thesis will examine these and other questions by considering the use of musical *harmonia* in Classical somatic theories, theories of the soul, and in the cosmologies of Philolaus and Plato.

Chapter 4

Somatic *Harmonia*

In ancient Greek medicine, health was conceived as the proportionate blending of two or more things, whether it be the elements, exercise to food, depletion to repletion, or the four humours. An excess or deficiency of any one of these things relative to the others could lead to illness, and in fact described a diseased state, which was therefore conceived as a departure from a properly proportionate blend. Health, on the other hand, was achieved when two or more of these elements or forces were proportionately blended or balanced with each other.

As we shall see, the idea of proportionate blending or balance came to be associated with a numerical ratio. In the case of overall bodily health, the proportion was one of equality (*isonomia*), i.e. 1:1. Thus, the healthy state was an overall equal balancing of the elements or humours. Disease was characterized by a ratio which was non-isonomic since it described a state in which one of the elements or forces was excessive or deficient.

It would appear, then, that *harmonia*, as a composite set of non-isonomic ratios which described positive states elsewhere, if applicable at all in this context, was descriptive of the state of disease. As we have seen, *harmonia* was often conceived as a principle which united opposites in such a way that one term was preponderant and unbalanced or unequal states in the somatic context were constitutive of disease. As shall be shown in this chapter, the principle of *harmonia*, however, was never used to describe diseased states, and there are good reasons for this. Although the non-isonomic ratios that are constitutive of *harmonia* may have been the same as those ratios that constituted the diseased state, *harmonia* was meant to underlie positive states, and disease was hardly that. Thus it would seem that the principle or structure of *harmonia* was not a suitable model for health or good bodily states.

Yet the ancient Greeks did use *harmonia* as a model for health and positive somatic states. In this chapter, I argue that the principle of *harmonia* was used (albeit occasionally) to describe overall health. This should not be terribly surprising given the early physical meaning of *harmonia* (the 'fitting together' of two or more things). Perhaps more surprisingly, however, musical *harmonia* was often used as a structural model for other good bodily states, for example, pleasure in perception and good composition and mixing in embryology and growth. Furthermore, Aristotle's conception of the state of health shows striking similarities to the structure of Philolaus's harmonic structure.

In this chapter, I shall examine how the Greeks characterized the good states of body, whether it be health or general fitness, or the body's proper functioning and composition. I shall determine both how the ancient Greeks used *harmonia* to describe health, and the extent to which they used *harmonia* as a structural model for other positive somatic states.

(I) Health as Balance and Equality

Scattered throughout many of the Presocratic and Classical Greek writings is the idea that everything bodily is made up of one or more of four basic substances which each have their own corresponding powers and characteristics. These substances typically were either earth, air, fire and water, and their powers or properties were various combinations of the opposites hot-cold and wet-dry, or alternatively the four humours: black bile, yellow bile, blood and phlegm (or slight variants of these four), which also displayed the above properties. Each part of the body was thought to be composed of some combination of them (whether it be flesh and bones and blood, or the various organs), and thus the body as a whole was made up of these substances.

In many writers, a part of a body, or the body as a whole, was thought to be ordered and healthy when these elements were mixed or brought together proportionately or were balanced with each other both internally and with respect to the predominant qualities in the external environment. Disease was thought to be a bad mixing in which one or more of the elements was in excess or defect to the other. Thus, positive states in the body were thought to be a balance or proportionate blending of the opposites, and disease was thought to be an imbalance or bad mixing in which one of the opposites was excessive or deficient.

There are many examples of this idea in ancient medical fragments and texts. For instance in the Hippocratic work *Nature of Man*, the author wrote that a person "enjoys the most perfect health when these elements [the humours] are duly proportioned [*metrios echei*] to one another in respect of compounding, power [*dunamis*] and bulk [*plethos*], and when they are perfectly mingled [*kresis*]" (iv.4-7).[1] The state of health is thus achieved when the four humours are blended according to due proportion. What this proportion must be sensitive to is the compounding of the humours, their qualities, and their quantities.

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[1] All passages from the Hippocratic Corpus are taken from the Loeb Classical Library *Hippocrates*. *On Ancient Medicine, Airs, Waters,*

We find similar ideas in the Menon Papyrus. According to the author, Philistion of Locri believed the following:

> ...we are composed of four 'forms', that is, of four elements--fire, air, water and earth. Each of these too has its own power (*dunamis*); of fire the power is the hot, of air it is the cold, of water the moist, and of earth the dry...The elements cause disease when the hot and the moist are in excess, or when the hot becomes less and weak....[2]

There is no mention of blending here, but it is implied that health consists of some sort of balance or proportion of the 'forms' or elements, since disease is characterized as an excess or deficiency.

Furthermore, according to the same author, Menecrates was thought to have a similar theory of health and disease:

> ...bodies are composed out of four elements, two of which are hot, and two cold, the hot being blood and bile, the cold, breath and phlegm. And when these do not disagree, but are in a state of harmony, the body is healthy; when they are not in harmony, it is diseased (*touton...me stasiazonton, all' eukrotos diakeimenon hugiainein to soma; duskrotos de echonton nosein*).[3]

Places, *Precepts* and *Nutriment* are found in Volume I; *Prognostic*, *Regimen in Acute Disease*, *The Sacred Disease*, and *Dentition* are found in Volume II; *Nature of Man*, *Regimen in Health*, *Humours*, *Aphorisms*, and *Regimen* I-III are found in Volume IV. All are translated by W.H.S. Jones.

[2] XX.25-49, as translated by W.H.S. Jones in *The Medical Writings of Anonymous Londinensis*, Cambridge (1947).

[3] XIX.18-33, translated by Jones in the above cited work.

Here we find the idea that it is the mixing itself that determines the state of the body. The body is composed of four humours, blood, bile, breath and phlegm.[4] Two of them are hot, and two cold. When these humours are forged together well (*eukrotos*) as in the case of a smithy forging together iron, the body is healthy. Disease occurs when the bond is broken. There is no mention here of the proportionate blending of the humours; instead, the main idea seems to be that the humours be welded together.

Health, according to these physicians, was conceived as a good mixing or forging of various opposed substances in due proportion. Disease was characterized by an excess or deficiency of one of these substances or their bad mixing. The nature of this proportion is not specified by these authors. Instead it is the general notion of proportion and blending that is in the forefront.

In other authors a specific ratio, one of equality, is more clearly suggested in the elucidation of the positive state--health. Instead of health being characterized by balance or proportion generally, a ratio of 1:1 is implied by such words as *isonomia*, *summetros*, *ana logon* and the like. We have already seen the use of specific ratios in the domain of music theory, but the isonomic ratio is different, and is based on a different model of cohesion and stability. I shall return to a discussion of *isonomia* and on what models the ratio of 1:1 was based after illustrating its use in ancient descriptions of health.

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[4] The humours employed by Menecrates are only slightly different than the traditional four: black bile, yellow bile, phlegm and blood.

The use of isonomic ratio is most clearly apparent in Alcmaeon's definition of health and disease, but it is also detectable in other authors. Preserved in Aetius is the following fragment from Alcmaeon:

> Constitutive of health is a state of equality [*isonomia*] among the powers [*dunameis*], moist-dry, cold-hot, bitter-sweet, etc. On the other hand, a state of domination [*monarchia*] among them is productive of disease. For the domination of one member of a pair is destructive of the other. Disease occurs through the immediate agency of hot or cold, for example, occasioned by taking too much or too little nourishment, and localized in the blood, marrow or brain. But it is also engendered in these at times from external causes--water...the locality...and the like. Health, however, is the proportionate blending [*summetros krasis*] of the qualities. (Aetius, V.30.1, trans. Tracy)[5]

The body, according to Alcmaeon, is composed of a number of opposite powers--the usual four (wet-dry, cold-hot) plus other, unspecified pairs.[6] When all the opposites that make up the body are equally powerful--when all the qualities are equally blended--the body is said to be healthy. On the other hand, when one in a pair is more powerful than the other, it destroys the other, and a diseased part or whole is the result.

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[5] Theodore Tracy *Physiological Theory and the Doctrine of the Mean in Plato and Aristotle*, The Hague (1969): 22-23.

[6] Aristotle wrote the following of the opposites employed by Alcmaeon: "In this way Alcmaeon of Croton seems also to have conceived the matter, and either he got this view from them or they got it from him; for he expressed himself similarly to them. For he says most human affairs go in pairs, meaning not definite contrarieties such as the Pythagoreans speak of, but any chance contrarieties, i.e. white and black, sweet and bitter, good and bad, great and small. He threw out indefinite suggestions about the other contrarieties, but the Pythagoreans declared both how many and which their contrarieties are" (*Metaphysics* I 5, 986a26-b2).

As is apparent from the passage, the domination of one quality can be caused by a number of factors. A diet that is unbalanced may disrupt the equality of the elements or powers, as may either bad water or water that is different than the person is used to. Furthermore, other external factors (i.e. the locality) may affect this internal *isonomia*. Thus, it is not just the case that the body is affected by that which it ingests, but it may also be affected by that which is truly external to it, e.g. winds, seasons etc.

Also recorded in the Menon Papyrus are the views of Petron of Aegina. Petron too appears to have made use of isonomic and non-isonomic proportions in his account of health and disease:

> ...our bodies are composed of a pair of opposites, the cold and the hot, and to each of these he assigns a partner, to the hot the dry and to the cold the moist, and out of these are our bodies composed. And he says that diseases may arise simply through the residues of nutriment. Whenever the belly taking in nutriment not commensurate (*summetra*) with it, but overmuch (*pleio*), cannot digest it, the result is that diseases occur. He also derives diseases from the

> aforesaid elements, when they are disproportionate (*anomala*).[7]

Again, the opposites involved are slightly different. Petron seems to have given priority to the pair hot-cold, and the pair wet-dry is subordinate to them, but regardless of this, all four are found in the body, and indeed make up the body. Further, health seems, in Petron's mind, to be present when the elements are proportionate or equal to one another, and disease occurs either when these elements become disproportionate or unequal, or when an excess of food is taken that is incommensurate with the belly. What this latter cause of disease suggests is that the belly is made up of a particular proportion of the elements (either one of equality or otherwise), and excessive food disrupts this ratio by leaving over a harmful residue.

Plato's account of health and disease in the *Timaeus* is another treatment in which isonomic and non-isonomic proportion are employed:

> The origin of disease is plain, of course, to everybody. For seeing that there are four elements of which the body is compacted,--earth, fire, water and air,--when, contrary to nature, there occurs either an excess or a deficiency of these elements, or a transference thereof from their native region to an alien region; or again, seeing that fire and the rest have each more than one variety, every time that the body admits an inappropriate variety, then these and all similar occurrences bring about internal disorders (*staseis*) and disease.... For, as we maintain, it is only the addition and subtraction of the same substance from the same

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[7] XX.1-14, as translated by W.H.S. Jones in *The Medical Writings of Anonymous Londinensis.*

> substance in the same order and in the same manner and in due proportion (*ana logon*) which will allow the latter to remain safe and sound (*son kai hugies*) in its sameness with itself. (*Timaeus* 82a-b)[8]

Health then is a dynamic equilibrium which is achieved only if the elements are added or taken away from the body in due proportion, and in the same order and manner. Disease is characterized by an excess or deficiency of one of the four elements, their dislocation from one part of the body to another, or the admission of an unfit variety of one of the elements into the body.

Aristotle too believed that health is a kind of balance or symmetry of the elements:

> Similar in character, too, is the definition of health, if it is a balance (*summetria*) of hot and cold elements; for then health will be necessarily exhibited by the hot and cold elements; for a balance of anything belongs to those things of which it is the balance, so that health will be an attribute of them. (*Topics* VI 6, 145b8-11)

Further, in the *Physics* he wrote: "Thus bodily excellences such as health and fitness we regard as consisting in a blending (*krasei*) of hot and cold elements in due proportion (*summetria*), in relation either to one another within the body or to the surrounding" (*Physics* VII 3, 246b6-7).

Although these authors differ from one another in the particulars of their theories, the following generalizations about the nature of the body and health (as an equality) can be made: (1) the body is made up of a number of opposites, either elements, powers or humours; (2) health is some balanced 'proper' proportion (e.g. *isonomia, homalos, summetria, ana logon*) of these opposites: some authors think that equality is the only proper proportion, and others generalize, presumably under the influence of Pythagorean mathematical theory;[9] and (4) this equality is realized in the 'proportionate blending' (*summetros krasis, metrios echei*) of the elements, qualities or humours.

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[8] Translated by R.G. Bury in the Loeb Classical Library *Plato IX: Timaeus, Critias, Cleitophon, Menexenus and Epistles*, Cambridge, Massachusetts (1929). All passages from the *Timaeus* are taken from this volume.

Disease, on the other hand, is a disruption of this balance or equality, caused by either the excess or deficiency of one or more of the elements. Thus disease is characterized as a *monarchia* of one of the elements or properties, or an *anomalos* union. It is also implied that the union of the opposites in a body that is diseased is not as it should be by Menecrates' use of the term *duskrotos* which means a bad welding or forging.

As we have seen, the use of ratios (and perhaps also number itself) by the Pythagoreans was inspired by the observation that the pleasing concords in music could be described as ratios between, for example, the lengths of string that were sounded. In this context, the question arises as to where the ratio of 1:1 came from? Was there a model that inspired the Greeks to use this ratio so often in their characterizations of health?

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[9] In his treatment of the mean in virtue (NE II), Aristotle implicitly promotes complex arithmetical notions of the mean, and not just the 'arithmetic' mean, but others. In a sense, this is equivalent to the proliferation of different proportions, not just equality, but others. See pages 141 ff. of this thesis.

According to Aristotle, both friendship and justice were thought to be an equality in traditional beliefs. In the *Nicomachean Ethics*, Aristotle argued that friendship is an equality, and this belief conformed to what was traditionally said of friendship. He wrote the following:

> And in loving a friend men love what is good for themselves; for the good man in becoming a friend becomes a good to his friend. Each, then, both loves what is good for himself, and makes an equal return in goodwill and in pleasantness; for friendship is said to be equality, and both of these are found most in the friendship of the good.
> (*Nicomachean Ethics* VIII 5, 1157b32-36)

In fact, according to Diogenes Laertius, the belief that friendship is an equality went back to Pythagoras himself (viii.10).[10]

Furthermore, justice too was traditionally thought to be an equality. As we saw in Chapter 3, the Pythagoreans thought that "reciprocity and equality were properties of justice" and this is why they said that justice was the number 4 (or 9).[11] Aristotle too believed that justice was equality[12], but he made a distinction between two different kinds of equality: numerical equality and proportional equality. For example, in the *Politics* he wrote the following:

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[10] See also Burkert *Lore and Science in Ancient Pythagoreanism*, p. 171.

> Now equality is of two kinds, numerical and proportional; for the first I mean sameness or equality in number or size; by the second, equality of ratios. For example, the excess of three over two is numerically equal to the excess of two over one; whereas four exceeds two in the same ratio in which two exceeds one, for two is the same part of four that one is of two, namely, the half. (*Politics* V 1, 1301b30-35)

Therefore, one kind of equality (numerical) is based on the units or substances being of the same size or quantity, whereas the second kind of equality (proportional) is based on the equality of ratio.

Numerical equality is the model for friendship and justice between equals, whereas proportional equality is the model for friendship and justice between unequals. This is illustrated by the following passage from the *Eudemian Ethics*:

> But since equality is either numerical or proportional, there will be various species of justice, friendship and partnership; on numerical equality rests the democratic partnership, and the friendship of comrades--both being measured by the same standard, on proportional the aristocratic and the royal. For the same thing is not just for the superior and the inferior; what is proportional is

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[11] See Aristotle, Fragment 203, 38.8-12.

[12] See for example *Nicomachean Ethics* V 1, 1129a34, where Aristotle has a fairly detailed treatment of justice and the mean.

> just. Such is the friendship between father and child; and the same sort of thing may be seen in partnerships.
> (*Eudemian Ethics* 1241b33-40)[13]

Thus we have two different models on which equality in health could have been based. The one is a numerical equality which is manifest in democracy and friendships between equals, and the other is a proportional equality which is manifest in aristocracy and friendships and justice between unequals.

In all of the texts that we have considered so far, the isonomic proportion seems to refer to numerical equality. Although, as we shall see, proportional equality does play a large role in medical thought, the characterization of health itself as an *isonomia* or *summetros* of the various elements or properties implies the sort of equality that is manifest in democracy. This is shown in part by the fact that Alcmaeon characterized disease as a *monarchia* of one of the elements. Furthermore, proportional equality doesn't fit the model of health, since health in an individual is not a four-termed relationship, which is necessary for a proportional equality to exist, e.g. A:B::C:D.[14]

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[13] See also *Politics* V 1, 1301a28-b29, *Nicomachean Ethics* VIII and Plato's *Gorgias* 508a where he wrote, "Wise men, Callicles, say that the heavens and the earth, gods and men, are bound together by fellowship and friendship, and order and temperance and justice, and for this reason they call the sum of things the 'ordered' universe, my friend, not the world of disorder or riot. But it seems to me that you pay no attention to these things in spite of your wisdom, but you are unaware that geometric equality is of great importance among gods and men alike...".

Another reason why the ancient medical thinker may have characterized health as a balance based on equality is that two or more terms, when equally balanced with one other, are relatively stable. If no power is predominant--if the qualities of each cancel each other out--then a stable union is produced.[15] In no other union of opposites can stability be explained by the proportion of the terms.

Thus, it appears that according to these ancient writers (in particular Alcmaeon, the author of *Nature of Man*, Plato and Aristotle), the body is a blending of various opposites. Health was present when this blending was measured or proportionate, and what was meant by this proportion was usually what was later called numerical equality and was based on the model of friendships between equals or democracy.

Before turning to a discussion of how the ancient Greeks used harmonic proportion in their discussions of health and positive somatic states, I would like to briefly examine how the healthy, balanced organism was thought to exist in and react to its environment. By so doing, I hope to illustrate how difficult it was to preserve health according to ancient thought, even though, as was mentioned above, the numerically equal proportion underlying the healthy state was inherently stable. Furthermore, a use of proportional equality in ancient Greek medicine shall also be illustrated.

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[14] See Aristotle's *Nicomachean Ethics* V 3, 1131a11-b15.

[15] For a detailed discussion of the stability of health, see Chapter 7.

That the environment (both what is ingested and what occurs from without) plays a very important role in the attainment, preservation, and destruction of health is a very common idea in ancient Greek medicine. For example, the Hippocratic work *Ancient Medicine* is largely composed of a discussion of what qualities and quantities of food are appropriate for various constitutions, and the author of *Airs, Waters, Places* thinks that in order to pursue medicine, one must know the effects of each the following on constitutions and characters: the seasons, the winds, properties of water, the risings of the sun, the aspect of the town in which the patient resides, the soil and the mode of life (with respect to food, drink and exercise).[16] The author of *Regimen I* adds to this list the age of the individual, the constitution of the year, and the effects of the stars and planets on individuals (I.ii.30-35).[17]

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[16] See chapter 1 of *Airs, Waters, Places*. For a summary of how these environmental factors affect constitutions see chapter 10. Aristotle too believed that the environment and locality affect health and constitutions. See *Politics* VII.xi.

Because all of the above factors could and did affect individuals with regard to this internal bodily equilibrium or balance, they all had to be analyzed in terms of their composite elements and their powers to augment or counteract the proportion of elements or powers in people.[18] When a patient was sick, the proper procedure of the physician was to determine what part of the body was diseased, what element or humour was unnaturally predominant in this part, and then prescribe a regimen or medicine which would counteract the excess of the element in question.[19] The regimen or medicine prescribed would be chosen for its predominant quality or power--the quality or power which would be opposed to that quality which was in excess in the body.[20]

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[17] These ideas are echoed or repeated in many other Hippocratic works. See for example *Nature of Man*, chapter 7; *Regimen in Health* chapters 1 and 2; *Regimen II* and *III;* *The Sacred Disease* chapters 13, 16 and 21; *Prognostic* xxiv.18 and xxv.10.

[18] See for example *Regimen I* where the author wrote that the physician must know "the power possessed severally by all the foods and drinks of our regimen, both the power each of them possessed by nature and the power given them by the constraint of human art" (ii.8-13).

[19] See *Regimen III* where the author writes the following: "But the discovery that I have made is how to diagnose what is the overpowering element in the body, whether exercises overpower food or food overpowers exercises; how to cure each excess, and to ensure good health so as to prevent the approach of disease, unless very serious and many blunders be made. In such cases there is need of drugs, while some there are that not even drugs can cure" (chp. 67). See also *Aphorisms* II.xxii.

The physician was also responsible for the preservation of health in his patients. The physician had to know how to preserve the healthy proportionate blending of the elements within the body, even though they were perpetually susceptible to influence from the environment. The physician had to anticipate the changes in the environment of his patient and counteract them before they affected the bodily equilibrium.[21] For example, in chapter 1 of *Regimen in Health* the author gave a synopsis of the qualities of each season, and the food required to counteract these qualities, e.g. winter is cold and wet, so people should eat a lot and drink little in order to make their bodies dry and hot. By making their bodies thus (hot and dry), the qualities of the season (cold and wet) would be counteracted, and the proportionate blending (equality of the elements) would be preserved. Thus, the author recommended that "in fixing regimen pay attention to age, season, habit, land and physique, and counteract the prevailing heat or cold. For in this way will the best health be enjoyed" (ii.17-18).[22]

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[20] See *The Sacred Disease* XXI.16-26, where the author writes that diseases are 'worn down' by the application of opposite powers or qualities: "For in this disease as in all others it is necessary, not to increase the illness, but to wear it down by applying to each what is most hostile to it, not that to which it is conformable. For what is conformity gives vigour and increase; what is hostile causes weakness and decay. Whoever knows how to cause in men by regimen moist or dry, hot or cold, he can cure this diseases also, if he distinguish the seasons for useful treatment, without having recourse to purifications and magic". Further, in *Nature of Man*, the author writes "To know the whole matter, the physician must set himself against the established character of diseases, of constitutions, of seasons and of ages; he must relax what is tense and make tense what is relaxed" (ix.4-8). Also see *The Art* v.12-21 and xiii.18, 25, and *Regimen III*, chapters 70 through 84 for specific cures for a variety of imbalances.

[21] See *Airs, Waters, Places* chapter xi.

In chapter 32 of *Regimen I* the author recommends discerning the constitution of a patient in terms of what powers are congenitally predominant. He then prescribes a regimen for each constitution which will naturally counteract these powers. For example, when a person has a cold and moist nature, they require a regimen of hot and dry foods and exercise; a dry and cold nature requires a warm and moist regimen, etc. Further, in the next chapter the author specifies which qualities are predominant in different stages of life: children are moist and warm, youths are warm and dry, middle age is characterized by a predominance of dry and cold, and the elderly are cold and moist. An appropriate regimen will again counteract these tendencies so that the elements will be in balance.

Therefore, the physician's task, both as a preserver and restorer of health, was to prescribe a regimen that was appropriate for the individual. No one treatment or regimen would work for all people, since everyone is different (e.g with respect to age, constitution, locality, etc.). What this suggests is that the physician was working with proportional equality in his treatment of individuals, what Aristotle called the 'relative mean'. He wrote the following in the *Nicomachean Ethics*:

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[22] See *Regimen in Acute Diseases* for a similar sentiment: "It is beneficial, then, in these cases to counterbalance the change" (xxix.1).

> By the intermediate in the object I mean that which is equidistant from each of the extremes, which is one and the same for all men; by the intermediate relatively to us that which is neither too much nor too little--and this is not one, nor the same for all. (*NE* II 6, 1106a29-32)

Thus, not only was health itself conceived as an equality between the elements and qualities, but regimen too was believed to be an equality. The nature of the equality, however, was different in each case. Health was thought to be characterized by a proportionate blending of the various elements according to numerical equality--the elements were arithmetically equal to one another in respect either to their power or bulk, etc. Regimen, on the other hand, made use of proportional equality (or the geometric proportion). What was appropriate for the preservation or restoration of health was different for each individual. For example,[23]

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[23] Please excuse the simplistic nature of this example. Although the sort of calculation that I employ is what the Greeks believed to be ideal, they knew that such exactness was impossible. See below. It is interesting that the same basic problem of measurement also arose in the context of architecture and the building of structures. Ideally, exact measurements were possible, but because of the absence of a standard

Kim has a constitution which is characterized by a preponderance of heat; fire is excessive by 4 units. The correct treatment would consequently be a 'cold' regimen--foods and exercises which cooled the body, presumably by 4 units. Further, Sandy has a constitution which is characterized by a preponderance of heat too, only fire is excessive by 2 units. The treatment in Sandy's case would be a regimen which cooled the body by 2 units. Thus, the regimens for each Kim and Sandy would be different and sensitive to their individual constitutions, but the goal and ratio employed is the same across both situations, in this case 1:1 (e.g. 2:2::4:4).[24]

Plato too spoke of the preservation of health and employed the idea of proportion in his explanation, but his theory is different from those found in the Hippocratic Corpus. He spoke of the preservation of health as if it were a matter of maintaining internal vibrations that were

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measure, the practical enterprise of the construction of buildings had to rely to a large degree on proportions, ratios and guess work.

[24] We can imagine too a proportional equality that is not based on the ratio 1:1. For example, drink, as well as having the power to cool the body, also has the power to nourish. Thus, the amount and power of liquids prescribed to a patient might, in Kim's case, be in excess of 4 'units of cool' since the powers of the liquid may be diminished by other powers in the body. Thus, the physician might prescribe a liquid in amount and strength of 6 'units of cool' in order that the original excess of heat be counterbalanced. Similarly, Sandy may be prescribed 3 'units of cool' to counteract the excess. The proportional equality is still maintained: 2:3::4:6, and 2:4::3:6, i.e. geometric proportion (A:B::C:D and A:C::B:D).

meant to ward off the influence of the environment, and thus keep the body in its natural order:

> ...if a man imitates that which we have called the nurturer and nurse of the Universe, and never, if possible, allows the body to be at rest but keeps it moving, and by continually producing internal vibrations defends it in nature's way against the inward and outward motions, and by means of moderate vibrations arranges the affections and particles which stray about in the body in their due reciprocal order, according to their affinities,--as described in the previous account which we have given of the Universe--then he will not suffer foe set beside foe to breed war in the body and disease, but he will cause friend to be set beside friend so as to produce sound health.
> (*Timaeus* 88d-e)

As in his account of soul, Plato's theory of the good states of body rests on an analogy between the body and the cosmos. The body is healthy when its parts are arranged in due proportion and each have their own movement which is analogous to the movements of the heavens.[25] In the case of the cosmos, there is no question of decay, since there is nothing outside of it. In the case of body, however, the environment is a problem, and Plato thinks that by imitating the divine movements, the body too may be able to preserve health.[26]

As we shall see in chapters 5 and 6, what Plato meant by 'due reciprocal order' is proportional equality; the elements of the cosmos are also thus arranged so as to ensure their maximum stability. That he believed health to be a balance characterized by a numerical equality, however, is also apparent. This is, in part, shown by the fact that health is 'friends set beside friends'.

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[25] See chapters 5 and 6 for further discussion of these points.

[26] That Plato believed medicine to be a kind of defense is also apparent in the *Epinomis*. He wrote the following: "As for what is known as the art of medicine, it also is, of course, a form of defense against the ravages committed on the living organism by the seasons by their untimely cold and heat and the like" (*Epinomis* 976a). For further discussion of the preservation and stability of health, see Chapter 7.

It is thus apparent that health was conceived by many ancient Greek thinkers as the bodily elements duly mixed in proper proportion. It was also the case, however, that these elements had to be in proper proportion to the elements in the environment, for what was external to an organism could and did affect its internal balance. The prescription of an appropriate regimen for an individual was consequently an extremely difficult task. Indeed, many ancient physicians believed that absolute precision in such prescription was impossible.[27] Nevertheless, it seems that ideal health was conceived as such a numerical equality between the elements, and regimen, to be sensitive to the individual constitutions of people, was based on proportional equality. The author of *Regimen I* wrote that "if...it were possible to discover for the constitution of each individual a due proportion (*arithmos summetros*) of food to exercise, with no inaccuracy either of excess or defect, an exact discovery of health for man would have been made" (ii.38-45).[28] Unfortunately (for the patient in particular), this numerical precision could only be approximated.

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[27] See for example *On Ancient Medicine* ix.1-22 and *Regimen I* ii.38-48.

(II) *Harmonia* and Positive Somatic States

The idea that due proportion or proper blending is involved in bodily states is not confined to general notions of health. As we have seen, proportion (i.e. proportional equality) is also used in regimen. The concepts of proportion, ratio, proper mixtures and harmony are also, however, found in discussions of the proper functioning of organisms, the proper arrangement of their parts, the proper mixtures of foods and drinks to be consumed by the organism, and sensory pleasure. Furthermore, the uses of proportion in these contexts were more often based on the model of *harmonia* than they were on general conceptions of health. Sometimes *harmonia* was used merely to mean a 'fitting together' in these contexts, but in other passages, we find particular ratios involved. As I have argued in Chapter 3, *harmonia* could be used as a proportion based on equality, as well as a proportion based on the non-isonomic ratios found in the octave. We find both uses of *harmonia* in descriptions of positive somatic states.

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[28] This idea is repeated often throughout the first three books of *Regimen*. See II.lxvi.80-84, III.lxvii.1-16, and III.lxvii.25-27.

Furthermore, there are striking similarities between the Hippocratic use of isonomic and harmonic proportion. Gregory Vlastos has argued that the *isonomic* proportion is very different from the Pythagorean concept of *harmonia*. He wrote the following:

> The general view of harmonious order in pre-Socratic cosmology and Hippocratic medicine is that of equality, i.e. the 1/1 ratio. But the Pythagorean discoveries of the concordant intervals in music led them to quite different ratios expressive of *Harmonia*: the 2/1, 3/2, 4/3 ratios, each of them pairs of unequal numbers and thus obviously contrary to the pattern of *Isonomia*.[29]

While Vlastos is certainly correct that health and harmony can employ different ratios, he has failed to notice both that the Hippocratics did use harmonic ratios in their conceptions of positive somatic states, and that in both isonomic and harmonic ratios, the conception of the opposites, the blending, and the structure is often the same.

In what follows I shall illustrate the use of *harmonia* as an expression of positive somatic states in ancient medical and biological texts. My goals are as follows: (1) to illustrate the various meanings of *harmonia* in these contexts (i.e. *harmonia* as a 'fitting together', *harmonia* as some unspecified proportion, and *harmonia* as the ratios underlying the musical concords), (2) to show that the opposites that are joined together by means of *harmonia* are typically non-axiological, (3) to show that the blending of both the opposites in the body and in music are analogous, and (4) to show that there is at least one conception of health that displays a structure which is nearly identical to that found in Philolaus's octave structure. These points shall be explained through discussions of pre-Socratic, Hippocratic and Classical theories of embryology, nutrition and growth, perception and bodily composition.

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[29] See page 345 of Gregory Vlastos' "*Isonomia*" in *American Journal of Philology* 74 (1953): 337-66.

(i) Embryology

A common idea in ancient texts that deal with embryology is that the successful formation of the embryo will take place only if the certain opposite elements, forces and parts of the fetus are well-tempered and harmonious. The positive state (i.e. a live, well-formed fetus), like health in general, is realized only when there is proper proportion. This proportion is, in some fragments and texts, characterized as an unspecified balance or mixture, in others as a proper 'fitting together', and in yet others, as specific ratios--either a ratio of equality or those that are found in musical *harmonia*.

The idea that the opposed forces must be in proper proportion for the fetus to grow unharmed is found in Parmenides' Fragment 18:

> When a woman and a man mix the seeds of Love together, the power (of the seeds) which shapes (the embryo) in the veins out of different blood can mould well-constituted bodies only if it preserves proportion. For if the powers war (with each other) when the seed is mixed, and do not make a unity in the body formed by the mixture, they will terribly harass the growing (embryo) through the twofold seed of the (two) sexes.[30]

It appears that Parmenides' view was the following. Both women and men contribute a seed or seeds at conception. These seeds each contain their own (generative?) power that is different and opposed to one other. For the embryo to be formed successfully, these powers must not only be mixed with one another, but they must make a unity in the body in which neither power is predominant or warring with the other. These powers will form such a unity only if they 'preserve proportion'.

A similar idea is expressed by the author of *Nature of Man*. He wrote,

> ...generation will not take place if the combination of hot and cold and of dry with moist be not tempered (*metrios pros allela*) and equal (*isos*)--should the one constituent be much in excess of the other, and the stronger be much stronger than the weaker.... Wherefore how is it likely for a thing to be generated from one, when generation does not take

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[30] DK B18, trans. Freeman, p. 46.

> place from more than one unless they change to be mutually well-tempered (*tes kresios tes pros allela*)?
> (*Nature of Man* iii.6-13)

Like health, generation will not occur unless the opposites are tempered and equal. The opposites must be 'mutually well-tempered'--if one is in excess or stronger than the other, generation will not take place.

The periods and nutriment of the embryo were also thought to be proportionate to one another. The author of *Nutriment* wrote that "Periods generally harmonize (*sumphonoi*) for the embryo and its nutriment; and again nutriment tends upwards to milk and the nourishment of the baby" (*Nutriment* xxxvii.1-3). Although this treatise is renowned for its obscurity, it is plausible that what is being suggested is that in different periods of the embryo's development, the amount of nourishment necessary for its continued growth is different. In general, the author writes, the nourishment provided by the mother is adequate, and is naturally regulated in order to preserve this harmony.

Perhaps the most striking example of the use of proper ratio in the development of the embryo is found in *Regimen*. In chapter 8 of Book I, the author speaks of certain parts of fire and water that are nourished in the embryo, presumably by food and water, and the parts of the embryo receive this nourishment until they cannot get any larger. At this point, these parts move into a larger place by force and necessity, and portions start to separate off and then commingle by changing position. The author then writes the following:

> If on changing position, they achieve a correct attunement (*harmonies orthes*), which has three harmonic proportionals, covering altogether the octave, they live and grow by the same things as they did before [food and water?]. But if they do not achieve the attunement (*harmonies*), the low harmonize (*sumphona*) not with the high in the interval of the fourth, of the fifth, or in the octave, then the failure of one makes the whole scale of no value, as there can be no consonance (*prosaeisai*), but they change from the greater to the less before their destiny. The reason is they know not what they do. (*Regimen* I.viii.8-19)

The continued existence and growth of the embryo thus depends on the proper arrangement and size of its parts. This proper arrangement is a conformity of the proportions found in the parts of the embryo with the proportions found in musical *harmonia*, i.e. the ratios 2:1 (octave), 3:2 (fifth), and 4:3 (fourth). What is striking about this passage is that for the first time we find the use of ratios other than 1:1, i.e. the isonomic proportion that is so prevalent in general conceptions of health. Why *harmonia* is used instead of *isonomia* in this context may very well be explained by the fact that the parts of the body are not equal in size or shape. Because of this inequality, an isonomic proportion would not be appropriate. Furthermore, because the author is speaking of the embryo, i.e. a whole with various parts, and he is trying to explain the successful whole with properly arranged parts, the analogy to musical *harmonia* is fitting given that the octave too is a whole with properly arranged parts. I shall return to this later in the chapter.

The use of proportion and proper mixture is thus found in embryology: embryos were thought to be successfully formed and grow when the elements or forces were well-tempered, proportionate, and equal; the embryo and its nourishment were thought to harmonize with one another in the different periods of its formation; and, at least according to the author of *Regimen I*, the embryo's parts, upon changing position in the mother's body, must achieve the correct *harmonia* or musical proportions in order for continued existence and growth.

(ii) Nutrition and Growth

The ideas of proper proportion and harmonious blends are also found in discussions on nutrition and growth. Not only should food be taken in amounts that are proportionate to (or counteract imbalances in) the constitution of an individual, but food itself (and medication) must be proportionately blended, excrement must be proportionate to the nourishment taken, and nourishment must be proportionate to exercise.

That food should be taken in amounts that are proportionate to individual constitutions and habits was an opinion held by many. As has been mentioned already, chapter 32 of *Regimen I* is composed of recommendations as to what sorts and quantities of food should be given to people with varying constitutions. Furthermore, this author wrote that although "it is impossible to treat of the regimen of men with such a nicety as to make the exercises exactly proportionate to the amount of food",[31] he has come very close to discovering how to diagnose the overpowering element in a body, "whether exercises overpower food or food overpowers exercises",[32] and how to cure each excess and thus achieve and preserve good health. The author of *On Ancient Medicine* wrote that because of the potentially injurious qualities of food, "the ancients too seem to me to have sought for nourishment that harmonized (*harmozousan*) with their constitutions" (iii.34-35). Aristotle too thought that at least the quantities of food recommended for a person to eat should depend on their constitution and the degree to which they exercise.[33] As we have seen, the proportion specified by Aristotle in this context is proportional equality, the geometric mean.

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[31] *Regimen III* lxvii.1-3.

[32] *Regimen III* lxvii.18-19.

There is also the idea in the Hippocratic texts that food and drink must be well-compounded before it enters the body so as not to disrupt the internal equilibrium. For instance, the author of *On Ancient Medicine* believed that all uncompounded (*akreta*) foods are detrimental to man, for their powers (*dunamei*) are too strong and cause pain and disease (chp. 3). Like Petron of Aegina, this author believed that strong foods are too powerful for the constitutions of men and thus cannot be assimilated. He wrote the following:

> The strongest part of the sweet is the sweetest, of the bitter the most bitter, of the acid the most acid, and each of all the component parts of man has its extreme. For these [the ancients] saw are component parts of man, and that they are injurious to him; for there is in man salt and bitter, sweet and acid, astringent and insipid, and a vast number of other things, possessing properties of all sorts, both in number and in strength. These, when mixed and compounded with one another (*memigmena kai kekremena alleloisin*) are neither apparent nor do they hurt a man; but when one of them is separated off, and stands alone, then it is apparent and hurts a man. Moreover, of the foods that are unsuitable for us and hurt a man when taken, each one of them is either bitter, or salt, or acid, or something else uncompounded (*akreton*) and strong, and for this reason we are disordered (*tarassometha*) by them, just as we are by the secretions separated off in the body...And from such

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[33] See Aristotle's *Nicomachean Ethics* II.6.

> [good] foods, when plentifully partaken of by a man, there arises no disorder at all or isolation of the powers resident in the body, but strength, growth and nourishment in great measure arise from them, for no other reason except that they are well compounded (*kekretai*), and have nothing undiluted (*akreton*) and strong, but form a single, simple whole. (*On Ancient Medicine* xiv.26-43, 50-57)

Food is composed of the same components or opposites as is the body (i.e. sweet, bitter, acid, salt, etc.). A healthy condition in the body is present when these opposites are well mixed and compounded, and none are apparent. Since food is composed of these same qualities, when we ingest food, we are affected by its composition, whether good or bad. Thus, if a food is unmixed and uncompounded and thus has a strong overpowering quality present, it will affect and disturb the mixture within an organism. This disruption manifests itself as pain and/or disease. Therefore, it is extremely important, according to this author, to pay attention to the composition of the foods and drinks that a patient eats.[34]

At least one Hippocratic author also believed that medicines are better when well-compounded. In *Regimen in Acute Diseases* the author wrote the following:

> If the pain be under the diaphragm, and does not declare itself towards the collar bone, soften the bowels with back hellebore, or peplium, mixing with the black hellebore

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[34] Further, it is not enough just to know that some foods are bad. For in fact the same food will have different effects on different people because individual constitutions are different, and this is relevant to what foods will be beneficial and harmful to them. For a discussion of this see *On Ancient Medicine* chapter 20.

> daucus, seseli, cumin, anise or some other fragrant herb, and with the peplium juice of silphium. In fact the blending of these constituents gives a harmonious compound.
> (*Regimen in Acute Diseases* xxiii.1-7)

Both mixtures, the author writes, alleviate pain, but one is more favourable to the crisis, the other better to counteract flatulence. There are other drugs that will help, but these are the best that this author knows of.

The author of *Regimen* also believes that foods should be well compounded or mixed, in order that health may be attained or preserved, and so that they be pleasant. In *Regimen I* the author compares various *technai* to the different parts of regimen. For example, in chapter xvii, the author writes that like builders who fashion harmonies out of diverse materials, "moistening what is dry, drying what is moist, dividing wholes and putting together what is divided" (xvii.1-4), the diet of man is meant to do the same thing, and "all these being diverse are harmonious (*sumpherei*)" (xvii.8). Food therefore is meant to produce harmonious blends in the body.

Chapter 18, which is presumably meant to expand on this idea, begins with a paragraph on musical composition and concords. Notes that are the most diverse, i.e. the high and the low, make the best concords, the least diverse make the worst. A song that was composed of just one note repeated over and over again would, the author writes, "fail to please" (xviii.7).

How he relates the case of music to diet is illuminating. He writes that cooks, like musicians, mix together ingredients that agree (*sumphoron*) while disagreeing (*diaphoron*); they neither make all things alike, nor would it be right if they mixed up everything into one dish. Thus the cook, like the builder, is supposed to fashion harmonious blends of different ingredients so as both to provide pleasure and ensure health.[35]

Lastly, it was believed that excrement must be proportionate to the nourishment taken. In *Dentition*, the author wrote that children are better nourished and healthier when they pass urine and stools proportionately. For example, chapter iv reads, "Children that pass copious stools and have good digestion are the more healthy; those that pass stools scantily, and with voracious appetites are not nourished in proportion (*me analogon*), are unhealthy" (iv.1-3). Similar ideas are found in chapters xiii and xiv: "Those that pass more urine than faeces are proportionately (*pros logon*) better nourished" (xiii.1-2), and "Those who do not pass urine in proportion (*me pros logos*), but from babyhood discharge undigested food frequently, are unhealthy" (xiv.1-3). Further, the author of *Prognostic* wrote the following:

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[35] The author continues at this point by explaining how the tongue is pleased by these harmonious mixtures. I shall discuss this passage in the next section. Regarding the proper mixture of the elements of food and their power to affect the body, see also Aristotle's *De Sensu* where he writes the following: "Heat causes growth, and fits the foodstuff for alimentation; it attracts that which is light, while the salt and bitter it rejects because of their heaviness. In fact, whatever effects external heat produces in external bodies, the same are produced by their internal heat in animal and vegetable organisms. Hence it is that nourishment is effected by the sweet. The other savours are introduced into and blended in food on a principle analogous to that on which the saline or the acid is used artificially, i.e. for seasoning. These latter are used because they counteract the tendency of the sweet to be too nutrient, and to float on the stomach" (*De Sensu* 442a5-12).

> Stools are best when soft and consistent, passed at the time usual in health, and in quantity proportional (*pros logos*) to the food taken; for when the discharges have this character the lower belly is healthy...But he should go to stool twice or three times during the day, according to the quantity of food taken, and once during the night.
> (*Prognostic* xi.1-4, 10-12)

Thus, the quality, quantity and timing of excrement must be proportionate in some way: those who pass copious stool and have good digestion are proportionately nourished; more urine must be passed than faeces for proper nourishment; and the quantity of faeces expelled must be proportionate to the food ingested. The kind of proportion is not specified. It cannot, however, be an isonomic relation. In order for nourishment to occur, some parts of the food must be assimilated or mixed with the body; it is what is left over that is expelled. Thus a proportion other than 1:1 is implied; however, proportional equality may be what the author is getting at.

Therefore, proportion is also apparent in ancient discussions of nutrition and growth. We find *harmonia* used to describe proportional equality, and the proper mixtures of food and drink, which imply both isonomic and harmonic ratio.

(iii) Perception

In the above section on nutrition and growth, we saw that in the Hippocratic work *Regimen* I.viii, foods, to be nutritious, had to have their component parts in ratios analogous to those found in music theory. Cooks, like builders and musicians, mix together ingredients that will effect harmonious blends, and these compounded foods ensure health by producing harmonious blends in the body. Furthermore, these blends were thought by the author to provide pleasure to the tongue. The author wrote the following:

> The notes struck while playing music are some high, some low. The tongue copies music in distinguishing, of the things that touch it, the sweet and the acid, the discordant from the concordant. Its notes are struck high and low, and it is well neither when the high notes are struck low nor when the low are struck high. When the tongue is well in tune the concord pleases, but there is pain when the tongue is out of tune. (*Regimen I* xviii.15-23)

If food is mixed in the proper ratios, the tongue will be in tune and will feel pleasure. If, however, food is not mixed according to these ratios, then the tongue, having been made discordant, will feel pain.

A similar idea is found in Aristotle's writings. In chapter iii of *De Sensu* Aristotle considers the mixing of colours and which mixtures are pleasant. All colours, he believes, are produced by the mixing (in some way) of black and white. He continues,

> Such, then, is a possible way of conceiving the existence of a plurality of colours besides the white and black; and we may suppose that many are the result of ratio; for they may be juxtaposed in the ratio of 3 to 2, or of 3 to 4, or in ratios expressible by other numbers; while some may be juxtaposed according to no numerically expressible ratio, but according to some incommensurable relation of excess and defect; and, accordingly, we may regard all these colours as analogous to concords, and suppose that those involving numerical ratios, like the concords in music, may be those generally regarded as most agreeable; as, for example, purple, crimson, and some few such colours, their fewness being due to the same causes which render the concords few. The other compound colours may be those which are not based on numbers. Or it may be that, while all colours whatever are based on numbers, some are regular in this respect, others irregular; and that the latter, whenever they are not pure, owe this character to a corresponding impurity in their numerical ratios. (*De Sensu* 439b25-440a5)

Or, it may be the case, Aristotle wrote, that the intermediate colours arise because of a 'mixing' produced in a way analogous to the overlaying of colours in painting:

> On this hypothesis, too, a variety of colours may be conceived to arise in the same way as that already described; for between those at the surface and those underneath a definite ratio might sometimes exist; in other cases they might stand in no determinate ratios.
> (*De Sensu* 440a12-15)

In the end, he rejects both the juxtaposition theory and the overlay theory, and instead believes that black and white are "wholly blent together" (440b3). But even on this view, the various colours arise in the same way, by different ratios:

> Colours will thus, too be many in number on account of the fact that the ingredients may be combined with one another in a multitude of ratios; some will be based on determinate numerical ratios, while others again will have as their basis a relation of quantitative excess.
> (*De Sensu* 440b18-23)

Therefore, regardless of how the mixture of black and white is conceived, it will always be the case that the colours that we find pleasurable are those which are composed of black and white in those proportions that are found in music (i.e. 3:2, 4:3 etc).

Aristotle thought that the same is true of taste. He wrote the following:

> As the intermediate colours arise from the mixture of white and black, so the intermediate savours arise from the sweet and bitter; and these savours, too, severally involve either a definite ratio, or else an indefinite relation of degree, between their components, either having certain numbers at the basis of their mixture and motion, or else being mixed in proportions not arithmetically expressible. The tastes which give pleasure in their combination are those which have their components joined in a definite ratio. (*De Sensu* 442a13-18)

Thus, like the intermediates in colour, the intermediates in savours are mixtures of the opposites bitter and sweet, and those savours which are pleasant to us are those that are mixed in definite ratio; those that are not pleasant are mixed in indefinite ratio.[36]

Therefore, in sense perception, what we find pleasant are those sense objects that are composed of the relevant opposites proportionately blended; sense objects that cause us pain are disproportionate mixtures--mixtures blended 'according to no numerically expressible ratio, but according to some incommensurable relation of excess and defect'.

That pain is produced by the disproportionate blending of elements is not confined to the case of perception. For example, the author of *Nature of Man* wrote that "[p]ain is felt when one of [the] elements is in defect or excess, or is isolated in the body without being compounded with all the others" (*Nature of Man* iv.7-9). Furthermore, the general situation in which excess or deficiency causes pain is fundamental to the ancient Greeks' conception of health and disease. Thus, visceral pain and sensory pain or displeasure are analogous; both are caused by a mixture of the elements that is not proportionate.

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[36] See also *De Anima* 426a27-b8 where Aristotle wrote that all of the sense modalities are analogous in this way: both sense objects and organs are ratios, and what is pleasant in all sense modalities are those objects that are brought into the proper ratio.

Aristotle's theory of perception (and perhaps also that of the author of *Regimen*), however, employs the isonomic ratio in a very different way than does health. Although, as we have seen, proportion is still very much involved in perception, the isonomic proportion plays a passive, potential role. For example, in *De Anima*, Aristotle wrote that a sense organ is a mean between the opposites that it perceives. It has the potential to become actually like its sense object, e.g. the touch sense organ is potentially hot, cold, hard and soft, and will actually become so if it be affected by such a sense object. Aristotle continues: "That is why we do not perceive what is equally hot and cold or hard and soft, but only excesses, the sense itself being a sort of mean between the opposites that characterize the objects of perception..." (*De Anima* II 11, 424a4). Thus, it is never the case that the sensations that cause pleasure are composed of opposites or elements in isonomic ratio. Indeed, sense perceptions blended in such a way fail to register on the sense organ. Instead, the opposites involved in pleasurable sensations are blended according to those ratios found in musical *harmonia* (2:1, 2:3, 4:3), ratios in which there is an excess or deficiency of one opposite.

There seems to be a bit of a puzzle here. On the one hand, as we have seen, in the case of external perception, sense objects are pleasing when they are composed of ratios that conform to those found in musical *harmonia*--ratios that are proportionate and made up of definite numbers. Sense objects cause pain or displeasure when they are not mixed according to these musical ratios, but instead have an incommensurable relation of excess and defect. The sense organ has a mean of its own when it is not perceiving anything from without, and this is one of equality--the isonomic relation of the two relevant opposites.[37] When the sense-organ is in this mean state, nothing is being perceived or felt, neither pain nor pleasure. Thus the positive, pleasurable states in perception are characterized by those ratios that are found in musical *harmonia*.

On the other hand, in the case of the body, the positive state, health, is present when there is an overall balancing of all the elements and powers that are predominant in the homogeneous and heterogeneous parts. This overall balancing is expressible by the isonomic proportion, 1:1. Again, presumably in the healthy state, neither pain nor pleasure is felt.[38]

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[37] This mean state of equality in the sense organ is also described at the level of the elements. The common sense organ which is the terminus of five external sense organs is placed by Aristotle in the mid-region of the body, the heart. This is so because it is here that the body is tranquil enough to allow for this mean state. He wrote, "in the middle cavity the blood, as regards quantity and heat, is intermediate to the other two [cavities], being however, of purer quality than either. For it behoves the principle part to be as tranquil as possible, and this tranquillity can be ensured by the blood being pure, and of moderate amount and warmth." (*Parts of Animals* 667a1-6). See also *Parts of Animals* 666a13-14, 678b3-4, *Movement of Animals* 702b13-19, and *On Sleep* 456a1-10.

Pain is present in the body at two levels. There may be pain in a particular organ when its particular ratio is disturbed. So, for example, I may feel a pain in my side due to a disproportion of the elements in my liver. This particular disproportion may, however, be counteracted by other organs, and so my pain may be isolated, and only the organ itself is affected; overall health is preserved. Or, it may be the case that the disproportion of the elements in my liver is not counteracted by other organs, and my general healthy isonomic proportion is affected. In this latter case, I will feel a general malaise, a more widespread pain.

What, however, of visceral pleasure? There appears to be no room for an elemental explanation of how we might feel pleasure from within our bodies, except perhaps incidental pleasure (i.e. that pleasure we feel after pain has been alleviated). This is because the positive state of the body is characterized by an isonomic proportion which, by itself, would be constitutive of a general feeling of tranquillity or unperturbedness. It would not, by itself cause feelings of pleasure, since pleasure is an extreme of a sort, and any excess or deficiency in the body will cause pain.[39]

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[38] See Plato's *Philebus* 32e: "If what we are maintaining is really true, if there is distress at the time of deterioration and pleasure at the time of restoration, then let us consider any such creatures as are experiencing neither deterioration nor restoration, and ask what their condition must be at the time in question. Please pay careful attention to what I ask, and tell me, is it not beyond all doubt that at such a time a creature feels neither pleasure nor pain in any degree whatever?".

That visceral pleasure could only be explained by the alleviation of pain or the restoration of the isonomic proportion is an idea which is common in ancient texts. For example, in the *Philebus*, Plato wrote the following exchange between Socrates and Protarchus:

> I maintain that, when we find a disturbance of the harmony of a living creature, that is the time at which its natural condition is disturbed and distress therewith occurs.-- That sounds very probable.-- Conversely, when the harmony is being restored and a return is made to its natural condition, we may say that pleasure occurs.
>
> (*Philebus* 31d)

What is more, a similar model of visceral pleasure in found in the Aristotelian *Problems*.[40]

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[39] I do not want to suggest that visceral well-being or contentment is always caused by the isonomic proportion. After all, since, for example, organs are often defined as being constituted by non-isonomic blendings of the elements, in their natural, healthy state, they will be non-isonomic. In this healthy state, they will presumably not cause pain. What I am trying to point out is that these non-isonomic ratios in the body will not produce pleasure; they will presumably be like the sense-organ in its mean state. At most they will produce a feeling of well-being, not pleasure.

[40] See for example *Problems* IV.15, IV.30, VIII.9 and XXVIII.5-6. The main idea found in these chapters is that pleasure is produced through the alleviation of pain--the greater the pain, the more intense the pleasure felt when the 'normal' state is restored.

Therefore, it appears that the use of proportion in the body and the use of proportion in sense perception is different in so far as proportion is constitutive of positive or desirable states. In the body, pleasure is felt when the isonomic proportion is restored, whereas in perception, pleasure is felt when the sense organ is in 'proportionate excess'--when it contains those ratios which correspond to those found in music theory.

(iv) Bodily Structures

We saw in the above discussion of embryology that the author of *Regimen I* believed that in order for the continued existence and growth of the fetus, its parts had to be of a certain size and arranged according to certain ratios. The idea that the parts of the body had to be in proportion to one another is found in many ancient discussions, whether what was being spoken of was just the external parts, or the internal.

Not only were the size and position important in this context, but also the qualities of the parts. Different parts were thought to be composed of proportionate amounts of the elements and/or powers, but this proportion was rarely, if ever, isonomic. Therefore, different parts had different qualities or powers predominant. These inequalities of elements and powers meant that different parts or organs had to counteract the qualities or powers of others in order for overall *isonomia* to be preserved, and continued good functioning. Therefore, it was not the case that bodily health depended upon the equality of the elements and powers simple. Instead overall health implied a complex balancing of all internal parts and propensities, since the 'normal' or 'natural' blending or proportion of specific parts was not isonomic.

In the following I shall look at a few examples of these ideas from the Presocratic writers and the Hippocratic corpus. Then I shall look at Aristotle since it is in his biological works that these ideas are, perhaps, most clearly developed.

According to Empedocles the body is made up of the four elements--water, earth, aether and fire--when they are mixed or brought together harmoniously.[41] Furthermore, each part of the body is composed of a slightly different proportion of these elements. For example, the eye is composed of more fire than earth,[42] and in general,

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[41] See for example DK B71 where Empedocles wrote: "But if your belief concerning these matters was at all lacking--how from the mixture of Water, Earth, Aether and Sun there came into being the forms and colours of mortal things in such numbers as now exist fitted together by Aphrodite..." (trans. Freeman, p. 59).

> The Earth, having been finally moored in the harbours of Love, joined with these in about equal proportions: with Hephaestus, with moisture, and with all-shining Aether, either a little more (of Earth) or a little less to their more. And from these came blood and the forms of other flesh. (DK B98, trans. Freeman, p. 62)

Therefore, each part of the body is composed of the four elements in particular ratio.[43] Moreover, even though the parts are severally composed, in health and good functioning, they all come together to form a unified whole: "...sometimes through Love all the limbs which the body has as its lot come together into One, in the prime of flourishing life; at another time again, sundered by evil feuds, they wander severally by the breakers of the shore of life" (DK B20, trans. Freeman, p. 54). When healthy, a body's parts harmonize together in due proportion--these parts too are constituted as a ratio of the four elements, but these smaller proportions are not isonomic.

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[42] See DK B85: "But the benevolent flame (of the eye) happened to obtain only a slight admixture of Earth" (trans. Freeman, p. 61).

[43] See also DK B107 in which Empedocles says, "For from these (Elements) are all things fitted and fixed together, and by means of these do men think, and feel pleasure and sorrow" (trans. Freeman, p. 63). That Empedocles defined and distinguished each part of the body by means of a ratio of the four elements is attested too by Aristotle: "For nature of an animal is a first principle rather than matter. There are indeed passages in which even Empedocles hits upon this, and following the guidance of fact, finds himself constrained to speak of the ratio as constituting the substance and nature of things. Such, for instance, is the case when he explains what is a bone. For he does not say it is this one element, or those two or three elements, or a compound of all the elements, but states the ratio of their combination. As with a bone, so manifestly is it with the flesh and all other similar parts" (*Parts of Animals* I 1, 642a17-24).

Although one does not find explicit mention of these ideas in the Hippocratic corpus, there are some passages that speak of the goodness of overall consistency of qualities, and others that show that an excess or deficiency of an element in a particular part of the body will lead to disease.

That the temperature and density of the body should be consistent throughout all of its external parts is mentioned by the author of *Prognostic*: "For the head, hands, and feet to be cold is a bad sign if the belly and sides be warm; but it is a very good sign when the whole body is evenly warm and soft" (*Prognostic* ix.1-4). Furthermore, the author of *The Sacred Disease* wrote that the cause of epilepsy is an unmeasured purging of the impurities in the brain during development in the womb:

> This disease attacks the phlegmatic, but not the bilious. Its birth begins in the embryo while it is still in the womb, for like the other parts, the brain too is purged and has its impurities expelled before birth. In this purging if the action be thorough and regulated (*metrios*), and if there flow away neither more nor less than is proper, the infant has a perfectly healthy head. But if the flux from all the brain be too abundant, and a great melting take place, he will have as he grows a diseased head, and one full of noise... (*The Sacred Disease* viii.1-11)

Therefore, according to the author of *Prognostic* an indication of disease is that the qualities of the external parts of the body are unequal. Furthermore, what is implied by the passage from *The Sacred Disease* is that the brain, in its healthy state, has a certain proportion of elements or humours. During growth in the embryo, this proportion becomes fixed, and if too much material is purged, epilepsy results--an imbalance among the humours.

Further, in *Nutriment* it is written that an organism's pulse and breathing vary according to age, and when they are harmonious, they indicate health:

> Pulsations of veins and breathing of the lungs according to age, harmonious (*sumphona*) and unharmonious, signs of disease and of health, and of health more than of disease, and of disease more than of health. For breath too is nutriment. (*Nutriment* xlviii)

Thus, although the ideas that individual parts have particular ratios and together they make up the isonomic ratio of the body, are not explicitly found in the Hippocratic corpus, there is evidence to suggest that at least some of its writers believed that this was the case. Particular parts of the body could be diseased by having the wrong proportion of the elements or humours, and in the passage from *Nutriment* we see that two different processes were supposed to be harmonized in order for health to be present.

Aristotle makes the ideas found in Empedocles explicit and systematized. In his biological works we find that each heterogeneous part of the body (i.e. organs) is not only harmonized with its function, but each is designed to counteract another part and the natural qualities found in certain regions of the body. Further, the homogeneous parts of the body (i.e. flesh, bones, etc.) must be present in a measured amount for the body to function properly as a whole.[44]

According to Aristotle, each part of the body is naturally disposed to perform its own function, whether the function be to counteract the powers or qualities of another part, or whether the function concerns the external, e.g. self-defense or movement. For example, In *Parts of Animals*, he writes that "All these parts have been so contrived by nature as to harmonize with the various operations that relate to the food and its residue" (*Parts of Animals* III 14, 675b12-13). Furthermore, animals are contrived by nature to have defenses against predators, and their bodily parts are structured in such a way as to ensure this (*Parts of Animals* IV 10, 687b6-7). In *Progression of Animals* we find the idea that the structure of birds must harmonize with their swift movement (710a29).

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[44] For Aristotle's discussion of the degrees of composition, see *Parts of Animals* II.i.

Therefore, the organs and structure of bodies are contrived by nature to be in harmony with their individual function and the function of the organism as a whole. Each organ, however, has its own character. For example, the marrow has a hot nature and the brain is cold.[45] Although some think that the brain consists of marrow, "in reality the two may be said to be utterly opposite to each other in character" (*Parts of Animals* II 6, 652a27). Aristotle continues:

> For of all the parts of the body there is none so cold as the brain; whereas the marrow is of a hot nature, as is plainly shown by its fat and greasy character. Indeed this is the very reason why the brain and spinal marrow are continuous with each other. For, wherever the action of any part is in excess, nature so contrives as to set by it another part with an excess of contrary action, so that the excess of the two may counterbalance each other.
> (*Parts of Animals* II 7, 652a28-34)

The brain, being by nature cold, thus counterbalances the nature of the marrow in order to moderate its excessive heat.

Furthermore, the brain's coldness is also meant to counteract the heat of the heart. In all sanguineous animals, in which there is heat because of the blood, there needs be a brain in order to balance this hotness:

> ...all animals must necessarily have a certain amount of heat. But as all influences require to be counterbalanced, so that they may be reduced to moderation and brought to the mean (for in the mean, and not in either extreme, lies their substance and account), nature has contrived the brain as a

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[45] See also *De Sensu* 438b28.

> counterpoise to the region of the heart with its contained heat, and has given it to animals to moderate the latter, combining in it the properties of earth and water.
> (*Parts of Animals* II 7, 652b16-23)

Thus the brain counterbalances the hotness of both the marrow and the heart and blood.

The heart too is meant to counterbalance the coldness of another part of the body, the left side: "In all animals but man the heart is placed in the centre of the pectoral region; but in man it inclines a little towards the left, so that it may counterbalance the chilliness of that side" (*Parts of Animals* III 4, 666b7-10). Furthermore, the spleen counterbalances the liver, the lungs counterbalance the heart, and bladders exist to counterbalance the superabundance of the natural constituents of the lungs.[46]

We also find that the homogeneous substances in the body must be moderate in quantity. For example, Aristotle wrote:

> ...lard and suet when present in moderate amount are beneficial; for they contribute to health and strength, while they are no hindrance to sensation. But when they are present in great excess, they are injurious and destructive.
> (*Parts of Animals* II 5, 651b1-2)

Too much lard and suet would interfere with sensation, and would result in the death of the organism.

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[46] See *Parts of Animals* III.4 666a29, III.6 668b33-669a7 and III.8 670b33-671a8 respectively.

Therefore, it appears that according to Aristotle, each heterogeneous part of the body is made up of some sort of combination of the elements, but the elements are not isonomic. Thus, one or more of the qualities--hot, cold, dry, moist--is predominant in each organ. Different parts or organs, then, are meant to counterbalance each other by having a quality or qualities that are opposed to each other. For example, the brain, being cold, counterbalances the heat of the heart. It is not, however, the case that organs are paired off in exclusive twos; the coldness of the brain does not just counterbalance the heat of the heart, but it also counterbalances the heat of the marrow. Similarly, it is not just the brain that balances the heart, but the lungs too. The heart, furthermore, is not hot without reason; it is hot in part because it must counterbalance the chilliness of the left side of the body. Therefore, the balance of the qualities in the body was not conceived as the blending of two or more qualities according to the simple ratio of 1:1. The state of equality which constituted health was much more complicated than that. Health was an overall *isonomia*, but as there were many structural and material layers in the body, each part of which was defined by means of non-isonomic proportion, overall *isonomia* was achieved by a complex interplay or counterbalancing among many parts.[47]

According to what I shall now call the simple conception of health which was illustrated and explained in Section I, in order for health to be present in a body, the elements or humours had to be blended according to either a principle of balance or proportion, or in some cases, specifically isonomic proportion (1:1). As was discussed at the beginning of Section II, Gregory Vlastos believed that this isonomic relation is very different from the Pythagorean conception of *harmonia* (which employed the ratios 2:1, 3:2, 4:3, etc.). While Vlastos was certainly correct that health and harmony employ different ratios--one isonomic and the other non-isonomic--, he failed to notice that the conception of the opposites and blending are or can be the same in both.

Although Vlastos was right to emphasize Pythagorean dualism in his discussion of Pythagorean music theory, and to wonder how "the inequality involved in musical harmonies and that required by the moral dualism of their metaphysics" are to be merged, it does appear, as I have argued in Chapter 3, that there was a conception of musical *harmonia* in which the opposites--being the high and the low--are non-axiological.[48] Therefore, even though the Pythagoreans may have used the harmonic ratios to bring together certain opposites that were contained within their dualistic moral metaphysics, there was also a musical model for the harmonization of non-axiological opposites. This being so, there is an analogy between the opposites in (one conception of) musical *harmonia* and the opposites in medicine; they are both non-axiological.[49]

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[47] This more complex conception of health helps to explain why some authors believed that gradual changes in the environment did not necessarily cause diseases. It is sudden changes alone which are bad. See for example, *Aphorisms* II.li, III.i, and the Aristotelian *Problems* I.15, I.27, and VIII.18. If the change is gradual, the organism can make adjustments among the various organs so that overall *isonomia* is preserved.

Moreover, how these opposites are blended is quite similar in both musical *harmonia* and health; the mixture of opposites in music is at least analogous to the mixture of the elements in the body. According to Aristotle, the high and the low are blended together so as to produce one sensation. Indeed, Aristotle wrote that "it is impossible to perceive two objects simultaneously in the same sensory act unless they have been mixed.... Hence, when things are mixed we of necessity perceive them simultaneously: for we perceive them by a perception actually one" (*De Sensu* 447b10-11, 13). Thus a concord is a unity of the two opposites high and low. Similarly, we have seen that the notion of good blending is vital in theories of health, expressed as either *krasis*. Both terms imply a very close union of the opposites.

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[48] See pp 345-346 of Vlastos' "*Isonomia*" in *American Journal of Philology* 74 (1953): 337-66. Even in Aristotle's column of Pythagorean opposites, the opposites high and low do not appear. Further, it is hard to see how, for example, the low could be a privation of the high.

[49] While it is true that Aristotle makes much use of axiologically different opposites in his biology, in so far as they are used in blendings and are meant to counterbalance one another (in order to achieve an isonomic state), they are non-axiological. Examples of Aristotle's use of axiologically different opposites can be found in the following passages: *Parts of Animals* 648a10, 656a11, 658a21, 665b15-20, 667b32, 669b20, 670b18-22, 671b30; *Progression of Animals* 704b20, 710b6, 714b10-15 and all of chapters 4-6; *Generation of Animals* I.ii.

Therefore, while it is certainly true that the two cases employ different ratios in the mixtures of opposites, both use non-axiological opposites in their mixtures, and these mixtures were conceived in similar manners.[50]

If we consider the more complex conception of health that emerged from the above section on bodily structures (iv), we shall find an even more striking analogy between musical *harmonia* and conceptions of health. If it is the case, as I have attempted to show, that health was by some authors conceived not just as the equal blending of the elements, but also as the complex interplay and counterbalancing among many parts of the body, each of which was defined by non-isonomic proportion, then there is an analogy between health and *harmonia* as it was conceived by Philolaus. In Chapter 3 we saw Philolaus specify the magnitude of *harmonia* in Fragment 6a. What this amounted to was a description of the smaller ratios that made up a whole, i.e. the octave or *harmonia*, which is comprised of the ratio 2:1. The whole, therefore must exhibit the ratio 2:1, but can be made up of a number of smaller ratios (3:2, 4:3, 9:8, 256:243), which fit together. In the body, the whole must exhibit the ratio 1:1 to be healthy, but this isonomic proportion too can and will be made up of a number of smaller ratios as found in the various parts of the body. In both cases the whole is made up of parts that have their own non-isonomic ratios, and in both cases the smaller ratios must fit together or counter-balance each other in order for the ratio of the whole to be achieved or preserved. The destruction of both wholes is also analogous. The ratio 2:1 will be destroyed if the ratio of one of its component parts is changed and we have seen that the same is true of the body.

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[50] There may be a further analogy between the two cases, depending on what the Greeks thought was the goal of musical concords. In the case of the body, the goal is health, and *isonomia* refers to the kind of ratios involved in the blending of the elements. If the goal in music was pleasing auditory phenomena, then *harmonia* as a term refers to just the kind of ratios involved in the mixture. If then the goal in music is pleasing auditory phenomena, *harmonia* and *isonomia* are at the same level in the model; both refer to the ratios involved in mixture, and they are analogous. If, however, the goal of musical concords was measured arrangement (i.e. the harmonious structure itself), then *harmonia* and *isonomia* are not analogous, but instead *harmonia* and health.

Thus, it is not only the case that there is an analogy between the opposites employed in both health and musical *harmonia* and in both the mixture of these opposites was the same, but there is a further, remarkable similarity between the two--their structure. In the complex conception of health, not only are the opposites non-axiological and blended in a way analogous to the high and low in music, but in both there are a number of smaller, non-isonomic ratios that, when the whole is in its best state, fit together and counter-balance one another so that the overall ratio of the whole is preserved (i.e. 2:1 in the case of musical *harmonia* and 1:1 in the case of health).

In conclusion, it has been shown that the ideas of due proportion and proper blending play a very large role in general conceptions of health and the preservation of health. In some authors the nature of this proportion, blending, or balance is not specified, but in others the idea of the isonomic ratios is more clearly suggested. In these latter authors, equality or *isonomia* is present in two different aspects of health and its preservation. On the one hand, as we have seen, numerical equality was often behind theories of health; the opposed elements in the body, if healthy, had to be equal to one another, either in quantity or strength. On the other hand, proportional equality was also used by some authors to specify the sort of relation that should ideally exist between an individual's food intake and amount of exercise, and their constitution or situation.

As I have illustrated, *harmonia* was one of a few principles which were meant to describe both arithmetic and proportional equality in descriptions of health and its preservation. In this context, *harmonia* generally meant a 'fitting together', and the ratios specific to music theory do not appear to be invoked.

Due proportion, balance and *harmonia* were also used in discussions of the proper functioning of organisms, the arrangement of their parts, and theories of perception. In these cases, there was a stronger tendency to use *harmonia* in order to express positive states than in general conceptions of health. Sometimes *harmonia* once again just meant a 'fitting together', but in other places, the musical ratios (2:1, 3:2, 4:3) were used directly. It seems that where the opposites were not theoretically supposed to be mixed according to isonomic proportion, the writers turned without second thought to the harmonic ratios. Thus, in the case of embryology, where the parts were unequal in size and where position and arrangement was involved, the author of *Regimen* wrote that if the parts are not arranged according to the principle of *harmonia*, the fetus would die. Similarly, in the case of perception, the model for good mixture is found in sound perception, in which the opposites are pleasing when they are mixed according to the harmonic ratios.

It is interesting that in all of these cases, the use of musical *harmonia* as the model for positive somatic states is an a priori use. There are no data here, as there were in the case of whole numbers underlying the musical concords, that suggest or confirm that underlying these positive states are ratios of whole numbers (e.g. the parts of the fetus when well-organized and Aristotle's colour theory). The Greeks' use of musical *harmonia* thus seems to be entirely speculative, both with regard to the postulation of the underlying opposites, as well as with respect to the ratios and balances involved.

Finally, not only did the Greek medical writers use both isonomic and harmonic ratios to describe positive somatic states, but contrary to what Vlastos believed, there are similarities between the Hippocratic uses of harmonic and isonomic ratios. In both, there are correspondences between the conception of opposites, the blending and the structure.

Chapter 5

Psychological *Harmonia*

In the *Politics*, Aristotle wrote, "There seems to be in us a sort of affinity of musical modes and rhythms." This, he went on to say, "makes some philosophers say that the soul is a harmony, others, that it possesses harmony" (VIII 5, 1340b17-18). These two ideas--that the soul is a harmony, and that it possesses harmony--are prevalent in some ancient writers, although the determination of what these ideas amount to is not an easy task. In this chapter I shall try to sort out the theories that fall under these two general headings, and then examine in more detail the impetus behind these ideas.

(I) Soul as *Harmonia*

In the *Phaedo*, Simmias presents an objection to Socrates' belief that the soul is immortal (85e-86d). Socrates has just argued that the soul, like all other invisible things, is divine and immortal, whereas the body, like all visible things, is mortal. Simmias then objects that harmonies too fit into this analogue--harmonies being invisible, without body, beautiful and divine, the instrument physical, bodily, composite, earthy and akin to what is mortal (85e). Simmias then says:

> Then if someone breaks the lyre, cuts or breaks the strings and then insists, using the same argument as you, that the harmony must still exist and is not destroyed because it would be impossible for the lyre and the strings, which are mortal, still to exist when the strings are broken, and for the harmony, which is akin and of the same nature as the divine and immortal, to be destroyed before that which is mortal; he would say that the harmony itself still must exist and that the wood and the strings must rot before the harmony can suffer. (*Phaedo* 86a-b)[1]

What kind of account does Simmias have in mind? If the soul is a *harmonia* or attunement, two or more things must be brought together. We have seen that harmonies unite or blend opposites: what are the opposites here? It would seem that they are material, given that Simmias is likening the harmony of the soul to the harmony of a lyre in which harmony is dependent on the strings' length, tension, etc.--the high and the low. Indeed, Simmias continues by making the opposites involved explicitly material. His view is that "the body is stretched and held together by the hot and the cold, the dry and the moist and other such things, and our soul is a mixture and harmony of those things when they are mixed with each other rightly and in due measure" (*Phaedo* 86b). Simmias is presenting the idea that the opposites (hot and cold, dry and moist, etc.) are present in, presumably, all living bodies since the body is 'stretched and held together' by them. *Harmonia*, and thus soul, is present when these opposites are mixed correctly or proportionately.

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[1] Translations of the *Phaedo* are by G.M.A. Grube in his *Plato, Five Dialogues: Euthyphro, Apology, Crito, Meno, Phaedo*, Indianapolis (1981): 93-155.

As David Bostock has noticed,[2] although *harmonia* in this context is agreed by all to be the particular *harmonia* that is present in a particular lyre, and is thus not eternal (i.e. it is not a concord, or melody or tuning system that can exist in another lyre when the first has been broken), *harmonia* cannot simply refer to a particular audible note, concord or melody, since it is presented as something that is relatively stable. What this means is that both the attunement of the lyre and the attunement of the soul must refer to the particular (numerical) relationships that exist between the various components of the material, i.e. strings or bodily opposites. It is the state of the particular lyre or soul, regardless of whether or not music is being produced, or actions are being performed.

Furthermore, built into Simmias' view is the idea that the lyre or body can exist without *harmonia*. A lyre can simply be untuned; it is not the case that a lyre comes into existence only when the strings are brought into concordance. Similarly, as Simmias writes, bodies are 'stretched and held together' by the opposites, whether or not they are in the correct proportionate relations with one another.

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[2] David Bostock, *Plato's Phaedo*, Oxford (1986): 122. For a discussion of both Simmias' objection and Plato's reply, see the chapter entitled "The Soul as a Harmony", pp 122-134.

Thus, as a necessary result of Simmias' presentation, the soul cannot exist when the body's elements are not in the correct ratios to one another. Simmias says the following:

> If then the soul is a kind of harmony or attunement, clearly, when our body is relaxed or stretched without due measure by diseases and other evils, the soul must immediately be destroyed, even if it be most divine, as are the other harmonies found in music and all the works of artists, and the remains of each body last for a long time until they rot or are burned. (*Phaedo* 86c)

Therefore, it is not just the case that the body will survive the soul at death, but furthermore, the body when troubled by disease or 'other evils' is without soul though still alive.

The view that Simmias is presenting is non-standard, even considered in the context of ancient Greek thought. As we have seen, it was a common idea, at least in Hippocratic medicine, that the *harmonia*, or some sort of proper proportion or mixture, of the elements in bodies was constitutive of the state of health. Yet according to

Simmias, this proper mixture of material elements is constitutive of soul.[3] What is more, health and soul were not believed to be the same thing in any of the surviving texts as far as I am aware.

The peculiar nature of Simmias' presentation has led at least one author to argue that Plato himself devised Simmias' theory.[4] Certainly, at least on the face of it, the theory seems incompatible with the Pythagorean idea of metempsychosis and thus the immortality of the soul, even though there is a connection between the Pythagoreans and Simmias, Cebes and Echecrates, and the importance and use of *harmonia* was thought to be a distinctively Pythagorean idea. Before, however, considering whether there is an alternate formulation of the soul-as-*harmonia* theory that is compatible with Pythagorean beliefs, I shall examine Socrates' reply to Simmias and Aristotle's arguments against the possibility of soul as harmony.

Socrates begins his rebuttal to Simmias by showing that in fact Simmias has contradicted himself. Simmias has earlier agreed that the soul exists before it 'enforms' the body (had agreed to the correctness of the theory of recollection), and this view is incompatible with his presentation of the soul as a harmony of bodily elements, since in the latter case, harmony, and thus soul, is composed "last of all" (92b). Socrates, however, proceeds to respond to the view that the soul is a harmony, even though Simmias decides to reject this view in favour of the recollection argument.

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[3] Aristotle too thinks that while it is appropriate to predicate *harmonia* of health and the good states of body, it is inappropriate to predicate it of the soul. See *De Anima* I 4, 408a1-2, and the proceeding discussion of Aristotle's views on the soul as a harmony.

[4] See page 195 of H.B. Gottschalk's "Soul as *Harmonia*", *Phronesis* 16 (1971): 179-198.

Socrates' answer to Simmias is composed of two different arguments. The first has to do with whether the soul, if it is a harmony, can direct the body (92e-93a, 94b-95a), and the second whether something can be more or less of a soul and whether there are too many harmonies (93a-94b). Both arguments are extremely interesting, especially when considered in conjunction with Plato's views in the *Republic* and *Timaeus*. I shall consider each argument in turn.

(i) The '*Harmonia* Too Compliant' Objection

The first section of Plato's first argument establishes that anything that is a composite--anything that is composed of various elements or parts--cannot be in a different state than that of which it is composed (*Phaedo* 92e), nor can it "act or be acted upon in a different way than its elements" (93a). Since a harmony is just such a composite, it cannot direct its components, but is instead "directed by them" (93a). Therefore, on this view, a harmony is merely evidence that one's elements are mixed in due measure; a harmony cannot direct its elements, nor can it initiate movement.

At this point in the argument, Socrates breaks off to provide the second argument, but continues the first at 94b. It is here that we find out why Socrates finds this passive view of harmony, and thus soul, dissatisfying. "Of all the parts of man", Socrates asks, "can you mention any other part that rules him than his soul, especially if it is a wise soul?" (*Phaedo* 94b). Further, not only does the soul rule over the body, but it does so often by opposing the affections of the body. Thus, instead of the soul (as a harmony) never being at odds with its elements and merely following their natural direction, the soul (on Socrates' view) takes a very active role in directing the body. He says the following:

> [The soul rules] over all the elements of which one says it is composed, opposing nearly all of them throughout life, directing all their ways, inflicting harsh and painful punishment on them, at times in physical culture and medicine, at other times more gently by threats and exhortations, holding converse with desires and passions and

> fears as if it were one thing talking to a different one...
> (*Phaedo* 94c-d)

Therefore, far from just following the elements of which it is composed, the soul directs these elements--its body.

One notices a slight change in emphasis in the course of Socrates' reply. He began by following Simmias' definition of soul and harmony quite closely. Soul is just the proper mixture of the elements hot, cold, wet and dry. The soul must therefore be directed by however these elements are arranged, and presumably, by their natural propensities. Thus Socrates says when he is explaining how the soul can oppose the supposed elements of which it is made, "when the body is hot and thirsty the soul draws him to the opposites, to not drinking..." (*Phaedo* 94b). What Socrates is considering at this point are just those sorts of material elements or opposites that Simmias had mentioned in his objection. The natural propensities of these elements seems here to be something like 'hot craves cold' and 'dry craves wet', if the hot and thirsty body yearns for or needs cold water.

When, however, Socrates concludes this argument, he is not so clearly speaking in terms of the hot and cold, wet and dry, and their natural propensities. As we saw from the passage at 94c-d, the soul is said to converse with and rule over the desires, passions and fears. Although it is true that desires, passions and fears could be given a purely materialistic explanation in terms of the natural propensities of the elements, given that Plato (or Socrates) usually casts desires, passions and fears as being contained in the soul itself, it is likely that Socrates has moved beyond a reply to Simmias' presentation of the soul-as-harmony, to a general refutation of soul-as-harmony. I shall return to this possibility shortly.

(ii) The 'Too Many *Harmoniai*' Objection

As I have already mentioned, Socrates' second reply to Simmias has to do with whether one soul can be more or less of a soul than another. The first point that Socrates establishes with Simmias is that a harmony will be more or less of a harmony depending on how well its constituents have been brought together (93b). If, then, a soul is a harmony, there will be some souls that are more fully souls than others, since *harmoniai* come in degrees. This, both Socrates and Simmias agree, is an absurd consequence of the theory.

Furthermore, Socrates argues, if virtue and wickedness which reside in the soul are harmonious and disharmonious states respectively, how will the proponent of the soul-as-harmony view describe virtuous and wicked souls? Will (s)he say that "the good soul is harmonized and, being a harmony, has within itself another harmony, whereas the evil soul is both itself a lack of harmony and has no other within itself?" (*Phaedo* 93c) Socrates' question is strange. He is combining the two different connections of harmony and soul that Aristotle gave voice to in the *Politics*, i.e. soul-as-harmony, and soul-contains-harmony. On the one hand, he is asking whether a virtuous or vicious person will have a soul at all--i.e. whether their material constituents are arranged in due proportion. On the other hand, he is asking whether, on the view that virtue is a harmony in the soul, and vice is a disharmony, these virtuous and vicious people will have two harmonies, one, or no harmonies at all. What is confusing is that Socrates takes the erroneous position that on the soul-as-harmony view, a good person has a soul (which is a harmony) and within it is another harmony which represents virtue. This assumption is not warranted since the good person might not have a soul at all, given that they could be ill (and thus have their material components out of proportion), and yet still be virtuous. Similarly, Socrates presents the wicked person as having no soul at all, and further having no harmony within this lack of harmony (i.e. lack of soul). It is not the case, however, that the bad person will never have a soul. Indeed, on Simmias' explication of the soul-as-harmony theory, they will do so if their material constituents correspond to the state commonly referred to as healthy.

What, however, does positively come out of this section of Socrates' argument is the strangeness of a number of situations. For example, a good ill person would seem to have no soul at all, and yet, presumably, still be good. But how can they be good if goodness is a harmony contained within the soul, yet they have no soul? Compare this situation with the healthy bad person. On Simmias' presentation of the soul-as-harmony view, they will have a soul, yet there will be no virtuous harmony contained within it. It is surely absurd that a bad person will have a soul, and a good sickly person will not.

Socrates continues his reply by examining the consequences of the claim that one soul cannot be more or less of a soul than another. By the use of modus tollens, he argues that,

> P1: If one harmony is more or less of a harmony than another, then one soul is more or less of a soul.
> P2: One soul is not more or less of a soul than another.
> C: Therefore, one harmony is not more or less of a harmony than another.

With this conclusion, Socrates proceeds to argue that on the soul-as-harmony view, all souls will be equally good. His position is that if all souls are equally harmonious, and to be equally harmonious means that one soul "would have no greater share of disharmony or of harmony" (*Phaedo* 93e), i.e. one soul will not have a greater share of the harmony *contained within the soul*, then all souls must have an equal share of this harmony within the soul if they are all to be equally souls: "...according to correct reasoning, no soul, if it is a harmony, will have any share of wickedness, for harmony is surely altogether this very thing, harmony, and would never share in disharmony" (94a). Therefore, the consequence of this view is that "all the souls of all living creatures will be equally good, if souls are by nature equally this very thing, souls" (94a).

The following points result from Socrates' second reply: (1) it appears that Socrates adheres to the presupposition that it is appropriate to liken virtue to a harmonious state and alternately vice to a discordant state within the soul. This is made apparent at two places in his reply: first, when he considers whether the good person will have two harmonies, one as soul, and one contained within the soul, and secondly, the argument at 93e-94a makes sense only if one accepts this presupposition; all souls will be equally virtuous only if virtue is a harmony. (2) Because it is reasonable to think that virtue and vice are susceptible to degrees, and as we have seen in (1), virtue is a harmonious state and vice the opposite, it also seems reasonable to think that Socrates does believe that at least some sorts of harmonies can be more or less harmonious than others.[5] Therefore, (3) it appears that what Socrates is objecting to is just the analogy between *harmonia* and soul per se. He is not maintaining that there cannot be degrees of *harmonia*, nor is he saying that souls cannot contain varying degrees of *harmonia*. What he is rejecting is the idea that the soul itself is a *harmonia*; it is this that is impossible. Therefore, his argument at 93d in which he concludes by modus tollens that "one harmony is not more and more fully, or less and less fully, a harmony than another" is meant to apply only to that sort of harmony that *would* be analogous to the soul. What Socrates claims is that there is no such harmony, no such analogy. The soul must be something else.

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[5] Aristotle seems also to think that there are degrees of *harmonia*. See *Politics* VIII 7, 1342b12-16 where he wrote that the Dorian tuning system is a mean between other kinds of scales.

Plato's response to the view that the soul is a harmony went beyond Simmias' presentation of it. Simmias' explication of soul-as-harmony, as we saw, was simply the bringing together of the material constituents of the body in due measure. Plato's reply, however, seems to be intended to address any conception of soul-as-harmony. It would not matter whether what was brought together was the hot and cold, or, say, limiters and unlimiteds, Plato's dissatisfaction with the view would not be quelled.

(iii) Aristotle's Objections to the Soul-As-Harmony View

Aristotle too in *De Anima* argues against the idea that the soul is a harmony. He seems, moreover, to have in mind precisely that sort of theory which Simmias presented:

> [The view's] supporters say that the soul is a kind of harmony, for (a) harmony is a blend or composition of contraries, and (b) the body is compounded out of contraries. (*De Anima* I 4, 407b32-33)

This view of soul is misguided, he thinks, since in general it cannot explain the soul's power of originating movement, and "almost all concur in regarding this as a principle attribute of soul" (I 4, 407b34). Aristotle believes that the absurdity of this view becomes most apparent when one tries to reconcile it with the active and passive affections of the soul (I 4, 408a3).

Focusing, however, on the view that soul is a harmonization of material elements, Aristotle presents two alternative conceptions of *harmonia*, and then proceeds to show that in either case, the soul cannot be seen as such. The first and most proper meaning of *harmonia* has to do with "spatial magnitudes which have motion and position" (*De Anima* I 4, 408a6). In this case, *harmonia* means "the disposition and cohesion of their parts in such a manner as to prevent the introduction into the whole of anything homogeneous with it" (I 4, 408a7-8). The kind of *harmonia* that Aristotle is referring to here seems to be that which we found in Homer and Pausanias in Chapter 3. It is the idea of two or more things being fitted together as in the case of boards or stones to form a different whole, for example a raft or a wall. The physical components of the whole are bound together in such a way that the whole is then recognized to be such--to be a thing in itself which is different than its components, e.g. a raft or a wall. If more homogeneous materials are added to the whole, they do not become part of this whole. For example, if boards are piled on top of a raft, they remain as such, boards on a raft. The boards are not part of the raft; they are extra, separate things. Similarly, rocks on top of a completed wall do not become part of the wall (unless the extra effort is spent to make them such). This idea is made even clearer by comparing Aristotle's conception of a harmonized whole with a heap or pile. An extra rock can be added to a pile of rocks, but of course, the pile is not a harmonized whole.

Soul cannot be this sort of harmony--it cannot be, as Aristotle calls it, "a mode of composition". First, "there are many composite parts [of the body] and those variously compounded; of what bodily part is mind or the sensitive or the appetitive faculty the mode of composition?" (*De Anima* I 4, 408a12-13) What Aristotle seems to be saying is that if the soul is a harmony in this sense, then it must be some sort of 'whole' within the body. Since, however, there are many 'wholes', it is unclear to which we should assign soul, and thus any assignment will be arbitrary. There is nothing in this conception of soul that will make one choice more appropriate than another.

Furthermore, Aristotle asks, "And what *is* the mode of composition which constitutes each of them?" (*De Anima* I 4, 408a13) How is the matter organized? What is the mode of composition of the different faculties? What makes one mode a *harmonia* and another not?

The second meaning of *harmonia* is "the ratio between the constituents so blended" (*De Anima* I 4, 408a9). Thus, *harmonia* is identified with the numerical proportion of the elements that are mixed together. On a Simmias-type view of soul, the absurd consequence results: since many parts of the body are mixtures of the elements, and each part has a different ratio (I 4, 408a15)--indeed that they have different ratios is what makes them different from one other--, then there will be many different souls in the body (if "the ratio of mixture is in each case a harmony, i.e. a soul") (I 4, 408a16-17). He raises the following questions with Empedocles specifically in mind: Is the soul to be identified with the particular ratios of the parts of the body, or is it something above them and different? (I 4, 408a20); "Is love the cause of any and every mixture, or only of those that are in the right ratio?" (408a22); Is love this ratio, or is it something above it and different? (I 4, 408a23). Aristotle views these questions as problems for the theory and questions that cannot be adequately answered.

The main difference between Socrates' objections and those of Aristotle is that Socrates' prima facie problem with the theory was that it was incompatible with the immortality of the soul. But further, the Simmias theory presupposed a conception of soul that was very different from Plato's (Socrates') own. If the soul is a *harmonia*, then it cannot lead its constituents, but instead must be led by them; if the soul is a *harmonia*, then what of the (correct, according to Plato) view that the soul contains a *harmonia* which is to be identified with justice or moderation, or virtue in general? Aristotle, on the other hand, was not at all concerned to show the incompatibilities with this view and immortality. Instead his main concern was to show that the soul-as-harmony view was incompatible with standard notions of what the soul and body is, and how it is supposed to function--the powers of the soul. Aristotle's own conception of soul also comes out clearly through his discussion. Aristotle does not concern himself in *De Anima* I.4 with the theory that the soul contains a harmony, except insofar as to say that "it is more appropriate to call health (or generally one of the good states of body) a harmony than to predicate it of the soul" (408a1-2). Thus, it seems that Aristotle too might adhere to the theory that the soul contains a harmony, but I shall discuss this possibility later in this chapter.

Both Plato and Aristotle, however, are purportedly dealing with a soul-as-harmony theory that makes the elements which are brought together material ones. What of the possibility that there were variations of the theory that were not based on the material constituents of body? Are there any theories that conceive of the soul as a *harmonia* of incorporeal elements? The evidence is fragmentary and inconclusive. Given that the Pythagoreans seemed to have put a lot of stock in the idea of the profundity of *harmonia*, and given Philolaus' use of the opposing principles of limiters and unlimiteds and other polarities (if Aristotle's testimony can be trusted), it may very well have been the case that there were theories of this sort in Pythagorean circles. Philolaus' idea that what was true in one domain could be applied in others, makes possible the theory that the soul was a *harmonia* of some contraries, but whether these contraries were corporeal or incorporeal is unclear. Nothing is certain with regard to this question.

What is, however, clear is that Plato, in other dialogues, fills out the theory that the soul contains a *harmonia*: that there is a certain harmony between the body and soul, and that there is an analogy between these harmonies and the divine harmony. Far from rejecting the importance of *harmonia* then, Plato gives it a very important role in his theory of justice and epistemology. It is to these ideas that I now turn.

(II) Soul Possesses *Harmonia*

As we have seen, Aristotle thinks that it is more appropriate to call health or one of the good states of body a harmony than to "predicate it of the soul" (*De Anima* I 4, 408a1-3). Whether, then, Aristotle believes that *harmonia* can be contained within the soul depends on what connection there is, in his mind, between the body, or its material components, and the soul. Plato, however, clearly does more than predicate *harmonia* of the body or its good states; he clearly applies it to the soul. What is manifestly apparent, however, is that he applies *harmonia* only to *good* states, either those contained within the soul, or the correct fitting together of body and soul. As was shown through an examination of the *Phaedo*, however, Plato does not think that the soul itself is a harmony; it is something different.

In this section I shall look at Plato's *Republic* and *Timaeus* in order to show the following uses of *harmonia* in

Plato's thought which I have observed: (i) that the body should be harmonized with the soul, (ii) that harmony is a goal of education, (iii) that moderation is akin to harmony, (iv) that justice is a sort of harmony, (v) that bad states of soul are analogous to discordances, and (vi) that imitation and/or knowledge of other harmonies (either divine or otherwise) affects one's own soul, either by making it harmonious and good, or discordant and bad.

(i) *Harmonia* of body and soul

From an examination of the *Republic* and *Timaeus*, it is clear that Plato thought that the good states of both body and soul can and should be described as a *harmonia*, and that one should strive for this state in both. Plato, however, also believed that there should be a harmony between the body and soul, and that this is the most beautiful arrangement possible. Plato wrote the following in the *Republic*:

> When a man's soul has a beautiful character, and his body matches it in beauty and is thus in harmony with it, that harmonizing combination, sharing the same mould, is the most beautiful spectacle for anyone who has eyes to see.
> (*Republic* 402d)

One notices in this passage three things. The first is that the soul's harmony seems to be more important than the harmony of the body; the soul's character is foremost, and if the body matches its character, then an overall harmony is achieved. This point is supported by what Plato writes just a page later:

> It seems to me that a fit body does not by its own excellence ensure a good soul, but on the contrary it is a good soul which by its own excellence ensures that the body shall be as fit as possible. (*Republic* 403d)

There is a one-directional causal connection between the 'fitness' or *harmonia* of the soul and the 'fitness' or *harmonia* in the body. The good soul can ensure a good body, but not vice versa. This presumably is because the soul can direct and lead the desires of the body and choose to exercise, follow a regimen, etc., but a good body--one which is healthy and strong--can have no effect on the goodness of soul since there is no choice, no deliberation, involved. Indeed, at the end of Book IX, Plato describes somatic harmony as nothing on its own, but a good only if it leads to psychic harmony:

> It is not even health [the man of sense] aims at, nor does he consider it most important that he should be strong, healthy, or beautiful, unless he acquires moderation as a result, but he will cultivate harmony in his body for the sake of consonance in his soul. (*Republic* 591c-d)

Secondly, we may notice in the passage at 402d that there are no other conditions necessary for the attainment of the overall harmony than the individual harmonies of the soul and body. All that is required for this overall harmony is that the soul and body are each on their own harmonized. Lastly, there is an analogy between psychological harmony and somatic harmony--they are said to "share the same mould".

In the *Timaeus* Plato repeats these ideas, but gives a more elaborate explanation of the positive harmonious state as well as the dissonant ones:

> All that is good is fair, and the fair is not void of due measure; wherefore also the living creature that is to be fair must be symmetrical. Of symmetries we distinguish and reason about such as are small, but of the most important and the greatest we have no rational comprehension. For with respect to health and disease, virtue and vice, there is no symmetry or want of symmetry greater than that which exists between the soul itself and the body itself.
> (*Timaeus* 87c-d)

The harmonious state, then, is one of symmetry--it has "due measure". As in the *Republic*, this state is described as good and fair (and later the most beautiful (87e)). Further, in this passage, the positive harmonious state in the soul is called virtue, in the body health, and the dissonant or bad state is vice in the soul, disease in the body.

These symmetries, Plato wrote, are apparent to all who look. What people fail to notice, however, is that a symmetry between the soul and the body is equally, if not more, important:

> ...whenever a weaker and inferior type of body is the vehicle of a soul that is strong and in all ways great,--or conversely, when each of these two is of the opposite kind,--then the creature as a whole is not fair, seeing that it is unsymmetrical in respect of the greatest of symmetries...
> (*Timaeus* 87d)

A body, he wrote, that is weaker than or not equal in symmetry to its soul will not only be ugly, but "when joint effort is required" will be the source of "much fatigue and many sprains and falls by reason of its clumsy efforts" (87e). Furthermore, a stronger soul will "shake up the whole body from within and [fill] it with maladies"; it will waste the body if it pursues some investigation ardently; it will make the body inflamed and induce catarrhs if it engages in controversy for which the body is not fortified (88a).

On the other hand, a body that is stronger than its soul will make the soul even weaker by indulging in excessive food. The result is a soul that is obtuse, dull of wit, forgetful and ignorant. (88b)

There is only one "means of salvation" from either unsavoury state: the equal cultivation of both *mousike* and *gumnastike* (88c). By practising both, a person is more apt to have similar motions in their soul and body--motions that are harmonious.

(ii) *Harmonia* as a Goal of Education

In the *Republic*, Plato speaks at length about the importance of proper education and, in particular, the proper education of the guardian class. One of the most vital goals of early education is the habituation of children to love and hate what is appropriate, even before they are able to recognize the reason why this should be so. When they are mature enough to understand the reason, "he who has been reared thus will welcome it and easily recognize it because of its kinship with himself" (*Republic* 402a).

Education is divided into two parts: *mousike* and *gumnastike*. *Mousike*, very generally, has to do with intellectual education, whereas *gumnastike* has to do with physical education, both exercise and proper dietetics. In general, then, one has to do with the mind and other has to do with the body.

Of *mousike*, or education in the arts, Plato wrote that its goal is to bring a certain harmony to the soul. Thinking in particular of poetry and music and, in general, fine or beautiful physical phenomena, Plato wrote that "their rhythm and harmony permeate the inner part of the soul, bring graciousness to it, and make the strongest impression, making a man gracious if he has had the right kind of upbringing; if he has not, the opposite is true" (401d-e).

The goal of *gumnastike* is also a harmony, however somatic harmony is not the main emphasis of this sort of education. While it is true that physical education must provide training in order to make the body strong and healthy (which can be described as a *harmonia*), its main intent is to rouse the spirited part of the soul--the *thumos*:

> It seems then that a god has given men these two means, artistic and physical education, to deal with these two parts of themselves, not the body and the soul except incidentally but the spirited and the wisdom-loving parts, in order that these be in harmony with each other, each being stretched and relaxed to the proper point. --It seems so.-- We should then quite correctly call the man who achieves the most beautiful blend of physical and artistic culture, and in due measure impresses this upon his soul, the completely Muse-inspired and harmonious man, far more so than the musician who harmonizes the strings of his instrument. (*Republic* 411e-412a)

Therefore, although the goal of physical education is to make the guardians strong and healthy, this is just a means to a further end, the proper functioning or movement of the spirited part of the soul. When the *thumos* and wisdom-loving parts are in harmony with one another, then the soul contains order and beauty.[6]

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[6] Keep in mind the role that Plato assigns to courage. It is the preserver of right opinion. See the section entitled '*Harmonia* and Axiologically Different Opposites' in chapter 3.

Therefore, the goal of education is to make the soul harmonious. *Mousike* makes the soul gracious, and later we learn that it nurtures the "reasonable part with fine speech and learning" (441e); it educates through habituation, giving the soul "a certain inner harmony", but not knowledge (552a).[7] *Gumnastike* "[relaxes] and [soothes] the spirited part...making it gentle by means of harmony and rhythm" (442a). These two parts of education are thus the means of attaining a balanced, orderly, beautiful and harmonious soul.

(iii) Moderation akin to *Harmonia*

The goal of (at least early) education, then, is to make the soul harmonious. Knowledge does not need to be present, but the conditions necessary for knowledge must be established in the soul, and this, according to Plato, is a certain harmoniousness which results in a certain grace and gentleness--a simplicity of character. If children have been nurtured in such a way, knowledge, or the 'reason why' will be recognizable to them when their minds have matured to the necessary degree since there will have been established a certain "kinship" between them and knowledge.

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[7] For a similar idea see *Protagoras* 326a-b.

What, however, is the nature of this internal *harmonia*? Did Plato give a positive account of what psychological *harmonia* consists? By looking at his descriptions of moderation and justice, we shall come closer to answering these questions.

Plato thought that the virtue of moderation is like a *harmonia*. Defined as the agreement by all groups in a city as to who should rule and the satisfaction of each with their own position, Socrates and Glaucon agree that moderation is spread throughout the whole of the city. Plato wrote that moderation resembles a harmony because,

> ...moderation spreads throughout the whole, among the weakest and the strongest and those who are in between, be it in regard to knowledge or, if you wish, in physical strength or in numbers or in wealth or in anything else, and it makes them all sing the same tune. This unanimity would rightly be called moderation, agreement, that is, between the naturally worse and the naturally better as to which of the two must rule, both in the city and in each individual.
> (*Republic* 432a)

Moderation, then, is the agreement or harmony between the naturally superior and naturally inferior as to who should rule and who should be ruled. It is a harmony, therefore, between unequals, and it is manifested through mutual agreement.

(iv) Justice as a *Harmonia*

Plato also likened justice in the city and the soul to a *harmonia*. Like moderation, justice is not confined to just one part of the city or soul, but is instead spread throughout the whole. Further, as G.M.A. Grube has written, the virtue of justice is more positive than moderation in that "it implies that each group actually performs its function in the state", whereas moderation is just the satisfaction of each group with their position and their mutual agreement as to who should rule.[8] Plato wrote the following of justice in the soul:

> And justice was in truth, it appears, something like this. It does not lie in a man's external actions, but in the way he acts within himself, really concerned with himself and his inner parts. He does not allow each part of himself to perform the work of another, or the sections of his soul to meddle with one another. He orders what are in the true sense of the word his own affairs well; he is master of himself, puts things in order, is his own friend, harmonizes the three parts like the limiting notes of a musical scale, the high, the low, and the middle, and any others there may be between. He binds them all together, and himself from a plurality becomes a unity. (*Republic* 443c-d)

As in the case of moderation, the different parts of the soul (and analogously in the city) referred to here are the reasoning, the spirited and the appetitive parts. In order for a person to be just, each part of their soul must perform their own task and not perform the task of another.

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[8] See page 98, ftnt. 10 of G.M.A. Grube's *Plato's Republic*, Indianapolis (1974).

There is a natural ruler (the reasoning part) and a naturally ruled (the spirited and appetitive parts), and a soul is just when each of its parts performs its natural function (444d).

Justice also, however, has to do with the structure of the soul. The three parts of the soul must be ordered in a particular way if the soul is to be just or harmonious--ordered in the same way as the high, low and middle in a musical scale. When the soul is so organized, it becomes a unity, a whole. What this must mean is that justice is a harmony or unanimity between the ruling and ruled, and clearly the ruler is superior to the ruled. Like moderation then, the harmony involved in justice is like a political covenant in that it is a mutual agreement between 'different parties': from a plurality of views or opinions is generated consensus, unity.

In the case of justice, however, there is also an explicit use of the musical sense of *harmonia*. Justice is said to be the bringing together of the three parts of the soul in the same way that three notes (or more) are brought together in musical consonances or perhaps the octave. How Plato envisioned this analogy is not at all clear. The three parts of the soul are not axiologically equal; the rational part is clearly superior as it rules the other parts of the soul as well as being that part of the soul that contains the virtue of wisdom.[9] In music, if one note is viewed as superior to another at all, it is the middle note, *mese*, not one of the extremes. The rational part of the soul, however, is one of the extremes of the soul; what is analogous to *mese* is the spirited part. We have seen both in chapter 3 and in the above section on *harmonia* as a goal of education that Plato does indeed assign a role to courage and the spirited part of the soul that is analogous to *mese* in musical *harmonia*. Therefore, what doesn't seem to fit into the analogy is the role assigned to rationality.

The analogy is made no clearer by Plato's comparison between health and justice on the next page. He wrote: "To produce health in the body is to establish the parts of the body as ruler and ruled according to nature, while disease is that they rule and are ruled contrary to nature" (444d). Plato is misrepresenting what would have been the most common medical theories in his day. As we have seen, health was conceived as an equality (*isonomia*) or balance of the quantities, qualities, powers or forces of either the elements, humours, parts of regimen, etc. Disease, on the other hand, was conceived as the rule (*monarchia*) or excess of one of the elements or humours, causing the disturbance or destruction of this equal balance. Plato, however, is saying that health is the establishment of "the parts of the body as ruler and ruled according to nature", but according to common Hippocratic medical doctrine and his own theory in the *Timaeus*,[10] all of the elements (or humours etc.) must be equally balanced for health to result; no one part rules or is ruled by nature--indeed, this is the definition of disease. Thus it seems that Plato is deliberately misrepresenting the common notion of health in order for health in the body to be analogous to justice in the soul.

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[9] Notice too what Plato writes later in the *Republic*: "If the whole soul follows the wisdom-loving part and there is no internal dissension, then each part will be able to fulfil its own task and be just in other respects, and also each will reap its own pleasure, the best and the truest as far as possible.--Very definitely--But when one of the other parts rules in the soul to any extent, it cannot find its own pleasure and it compels the other parts to pursue a pleasure that is alien to them and false" (586e-587a).

Because Plato seems to be exaggerating the similarities between virtue and health, and the analogy between virtue and musical *harmonia* is slightly forced, it is tempting to assign a purely political meaning to *harmonia* here as one can do (perhaps justifiably) in the case of moderation. With respect to justice, however, Plato clearly seems to be viewing it as a positive, structural aspect of soul. If this is the case, then there is a stronger similarity between it and musical *harmonia* than between moderation and musical *harmonia*. I shall return to this question later in the chapter when I discuss the impetus behind the use of *harmonia* in the soul.

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[10] *Timaeus* 82a-b.

One thing, however, is more certain. When Plato spoke about *harmonia* being the goal of education, he meant the *harmoniai* of moderation and justice. This is brought out by Plato's belief that the possession of knowledge is not necessary for the possession of each *harmonia*, but each is a necessary prerequisite for knowledge, since its possession will make one 'akin' to 'the reason why'. Immediately following the passage at 443c-d that we have been considering Plato wrote the following:

> Being thus moderate and harmonious, he now performs any action, be it about the acquisition of wealth, the care of his body, some public actions, or private contract. In all these fields he thinks the just and beautiful action, which he names as such, to be that which preserves this inner harmony and indeed helps to achieve it, wisdom to be the knowledge which oversees this action, an unjust action to be that which always destroys it, and ignorance the belief which oversees that. (*Republic* 443e-444a)

The performance of just actions, whether or not they are known to be so, will achieve and preserve a harmonious soul. Wisdom is the knowledge that oversees these actions, but there is nothing in this passage which stipulates that the knowledge must come from that individual soul. Presumably, the ultimate goal is that one's own wisdom oversees just action, for then one will be truly just and virtuous. That one's moral teacher can provide this wisdom from without in youth, however, is entirely consistent with Plato's theory. By means of habituation, a youth will instinctively and spontaneously perform just actions, and their soul will thus be harmonious. When they are mature enough to understand the 'reason why' such actions are just, these actions will seem natural since they have been performing like actions all their life; their souls will already be 'akin' to such knowledge.

Therefore, it appears that Plato does give us a positive account of psychological *harmonia*. It is a bringing together of unequals, the three parts of the soul. While it may turn out that Plato is using only the political meaning of *harmonia*, i.e. mutual consensus, unanimity, a covenant, it also seems likely that the musical meaning of *harmonia*--i.e. a mathematically structured whole--is lurking in the background.

(v) Discordant souls

If moderation and justice are akin to, or are, harmonies in the soul, then it would make sense that their opposites are not harmonious, or discordant. In the passage from Book IV that we considered in section (iv), Plato wrote that "an unjust action [is] that which always destroys [the inner harmony], and ignorance the belief which oversees that" (*Republic* 444a). We have thus seen the idea that unjust actions and ignorance destroy the inner harmony of the soul, but does Plato think that these non-harmonious states are akin to musical discord? The question is whether vice was viewed by Plato as akin to political discord or animity, or whether vice is a structural unsoundness of soul.

Plato begins his discussion of vice at the end of Book IV. He wrote that "...there is one form of excellence and an infinite number of forms of vice, four of them worth calling to mind" (*Republic* 445c). These forms, both in the soul and in the city are the timocratic, oligarchic, democratic and tyrannical. Of course, his famous digression takes up Books V through VII and he resumes his discussion at the beginning of Book VIII.

Plato begins his discussion in Book VIII by considering how the best city and soul can be corrupted. He treats the matter as if one form of government--the worse--arises out of the better of necessity, and that timocracy arises out of aristocracy, democracy from timocracy, tyranny from democracy.[11] The first fall, from aristocracy to timocracy, occurs when the leaders of the city, ignorant of the geometric number which controls these things, incorrectly ordain when guardian children should be born (*Republic* 546b-d). These inferior children neglect both *mousike* and *gumnastike* with the result (as we can well imagine) that they possess an inferior character (546d). The different classes, as a consequence, become mixed: "Iron will then be mixed with silver and copper with gold, and a lack of homogeneity will arise in the city, and discordant differences, and whenever these things happen they breed war and hostility" (547a). The result, therefore, is heterogeneity and discord. The timocratic city arises out of such discord, and instead of honouring wisdom above all, its distinctive feature is the love of victory and honours (548c). The timocratic soul too is characterized by a love of power and honours (549a) and this is a result of a compromise. Plato describes the compromise as the result of a youth being pulled in opposite directions by his parents:

> ...his father nourishes the reasonable part of his soul and makes it grow, the others [his mother and colleagues] foster the spirited and appetitive parts. As he is not a bad man by nature but keeps bad company, pulled both ways he has

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[11] It is curious that Plato thinks that aristocracy is inherently unstable. I shall return to this issue in Section III.

> settled in the middle and has surrendered the rule over himself to the middle part, the victory-loving and spirited part, and becomes a proud and ambitious man.
> (*Republic* 550b)

Thus, the timocratic soul is ruled by the spirited part of the soul, against nature.

The oligarchic man is consumed by the desire to make money; he establishes the appetitive and money-making part as ruler in his soul (553c-d). He is thrifty and hard-working, but does not pay any attention to education. He enslaves his other desires as vain, and only nurtures his appetite for wealth (554a-b). "Such a man", Plato wrote, "would not...be without discord within himself, he is not one man but two" (*Republic* 554e). The oligarchic man's soul is discordant--there is conflict between the appetites and the other parts of his soul. The appetites are not by nature fit to rule, and yet they do so; the reasoning and spirited parts rebel. Because of this, "the true excellence of a harmonious soul, of one mind within himself, escapes him by far" (554e).

Democracy emerges out of oligarchy when the poor masses successfully revolt against the rich rulers. A political system is then established in which the members of the city are each given an equal share of political power and offices (*Republic* 557a). The city is characterized by extreme tolerance. Plato wrote sarcastically that "it would seem to be a pleasant constitution without any rulers and with much variety, distributing a kind of equality to the equal and the unequal alike" (558c). We know from Plato's Book IV discussion of the 'aristocratic' soul that this would be intolerable. One should not treat all parts of a city or soul as being equal since, after all, they are not. By nature one is superior and fit to rule, the others are inferior and fit to be ruled. The democratic soul, likewise, treats all appetites and pleasures as equally desirable:

> [The democratic man] does not welcome true reasoning or allow it into the guardhouse; if someone tells him that some pleasures belong to good and beautiful desires, but others belong to evil ones, that one should prize and pursue the former while the latter must be restrained and mastered, he denies all this and declares that all pleasures are equal and must be equally prized. (*Republic* 561c)

There is no plan to his life or soul. Nothing is sacred or prized above anything else; all is equal.

Tyranny arises out of democracy because of its excessive liberty (564a). Indeed, Plato believes that any excessive action in one direction will result in a reaction in the opposite direction (563d). The character of tyranny, therefore, is excessive servitude. Plato wrote of the tyrannical soul the following:

> If then, I said, the individual is like the city, the same structure must prevail in him, and his soul must be full of servitude and lack freedom, and it is the best parts of it

> which are enslaved, and a small part, the most wicked and mad, which is master.--That follows of necessity.--And will you say that such a soul is free or slave?--Certainly slave.--So the enslaved and the dictator-ruled city is least likely to do what it wants?--Quite so.--And the dictator-ruled soul will also be the least likely to do what it may want--that is, the soul as a whole; it will always be driven by violent frenzy and is full of disorder and remorse.--Of course. (*Republic* 577d-e)

The tyrannical soul, therefore, is ruled by its worst desires. All the other parts of soul are subjugated by its rule. The result: disorder, fear, grief, misery.

The four forms of vice, then, are all characterized by the improper rule of a part of the soul: the timocratic soul is ruled by the spirited part; the oligarchic soul is ruled by that part of the appetite which is concerned with money; the democratic soul holds all appetites as equally desirable; and the tyrannical soul is ruled by the worst sort of appetites. Therefore, there are structural flaws in each form of vicious soul (and city), and these structural flaws are described by Plato as 'disorder in the soul' and the like.

What of *harmonia* and discordance? Although it must be the case that harmonious souls are ordered in a pleasing and appropriate way (and thus there is an analogy between the harmony contained within a soul and musical harmony), in Plato's discussion of the vicious forms of soul, the word *harmonia* (and likewise 'discord') seems again to be used with only its political meaning in mind. In the passages we have considered, *harmonia* is used to mean unanimity, agreement, etc. and discord is used to mean faction, conflict, etc. Therefore, although it is implied that harmony means a beautiful or seemly arrangement--discord the opposite--, the explicit use of harmony and discord in Books VIII and IX is political. Thus, in the *Republic* it is only in his discussion of justice-as-harmony that Plato makes a direct analogy between the harmony contained in the soul and the harmony found in music.

(vi) The Effects of Imitating other *Harmoniai*

Although *harmonia* in the *Republic* seems to have been used in a primarily political sense, there is other evidence to suggest that a musical meaning is closer than may be immediately apparent. Plato, throughout the *Republic* and the *Timaeus*, wrote that external *harmoniai* affect the *harmonia* in the soul. In the *Republic*, this idea manifests itself, in the main, through his discussion of the sorts of poetry that should be allowed in the city. The main idea is that children should only be allowed to listen to the best kind of melodies and rhythms since their souls or characters are affected by all music/poetry. In the *Timaeus* these ideas are repeated along with a more elaborate theory of soul which is meant to explain how this phenomenon can occur.

The idea that external *harmoniai* can affect the soul's *harmonia* is important in this context because Plato and Aristotle both seem to believe the following: it is because of a certain similarity between the two kinds of harmonies (i.e. the harmony contained within the soul and external harmonies) that external harmonies can affect the harmony in our souls. If this is the case, then Plato's use of *harmonia* in the soul is more than metaphorical, and is directly meant to recall that sort of *harmonia* found in music theory. Furthermore, there were two phenomena known to the Greeks which could have served as the physical model for this affectation--sympathetic vibrations and resonance. In the following, I shall examine the idea that external *harmoniai* can affect the soul and the explanations furnished for it in order to determine the use of *harmonia* in this context.

In Book III of the *Republic*, Plato wrote that it is extremely important to have children imitate and take pleasure in good and noble acts. Therefore, much of traditional poetry had to be censored given that it exalted and praised impious or ignoble deeds. Furthermore, in addition to the proper choice of words, musical mode and rhythm had to be carefully chosen, since they too imitate the character of man, and will thus affect the character of their listeners. For example, the Lydian and Ionian modes purportedly make one 'drunk', soft and idle; the Dorian mode makes one courageous, self-controlled, and steady; the Phrygian makes one peaceful and moderate (*Republic* 398e-399a). As a consequence, Plato wrote,

> I do not know the musical modes...but leave me that mode which would suitably imitate the tone and voice changes of a brave man in battle action or any violent deed...[l]eave me also another mode, that of a man engaged in peaceful, non-violent, and willing action...[l]eave me those two modes, the violent and the willing, which will best imitate the accents of brave and moderate men both in misfortune and prosperity. (*Republic* 399a-c)

Thus, it seems that music imitates the character of men by imitating the accents of men; the 'tone and voice changes', for instance.

Rhythm too was thought to imitate character. Although Glaucon and Socrates do not know which kinds of metrical feet imitate which kinds of lives, they agree to consult Damon later in order that they may keep in their city those rhythms that are graceful, and discard those that are the opposite (400a-c).[12] Presumably, then, good men possess or employ a certain rhythm or rhythms in their actions that can be imitated in music.

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[12] Although not much is known of Damon, the following fragment was attributed to him: "Song and dance necessarily arise when the soul is in some way moved; liberal and beautiful songs and dances create a similar

In general, Socrates says "[u]nseemliness, poor rhythm, and discord are closely akin to poor language and poor character, while their opposites are closely akin to, and imitations of, a good and moderate character" (*Republic* 401a).[13] Therefore, it seems that Plato envisioned some sort of similarity between good actions, rhythm and *harmonia*, and good character or soul.

Aristotle, too, thought that music can imitate character, and that we are affected by these imitations. In the *Politics*, he wrote that music has many beneficial functions for society. In Book VIII, chapter 3, he reflected upon the reasons why music was introduced into education originally. He believed that it was not on account of its necessity or utility, but instead because it is one of the ways that a person should spend their leisure. It is liberal and noble--after all "to be always seeking

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soul, and the reverse kind create a reverse kind of soul" (DK B6, trans. Freeman, p. 71). Damon was treated as an authority on music theory and music's effect on the soul by Plato and later by Aristides Quintilianus in *De Musica*.

[13] See also 400e, where Socrates says, "...fine speech, fine music, gracefulness, and fine rhythm are all adapted to a simplicity of character, and I do no mean simplicity in the sense we use it as a euphemism for foolishness, but where the mind has established a truly good and fine character" (400e).

after the useful does not [make a] free and exalted soul" (*Politics* 1338b2).

Just two chapters later, however, Aristotle decided that music has an even nobler use than pure recreation. It also has influence over the character and the soul. Education, for Aristotle, is concerned with cultivating right judgements and the ability to derive pleasure from good dispositions and actions. Music, or more specifically, rhythm and melody, can imitate such dispositions and actions, e.g. anger and gentleness, courage and temperance and, of course, their opposites. Thus, by taking pleasure in the imitations of good actions, we will be apt to take pleasure in real, noble actions.

Aristotle, however, seems to be getting at something more interesting than just the pleasure that attends these imitations. He wrote that when "listening to such strains our souls undergo a change" (*Politics* VIII 5, 1340a23), and that our "feelings move in sympathy" with the imitations (1340a14). Further, there seems to be something natural about us being influenced by music in this way, as there is in us "a sort of affinity to musical modes and rhythms" (1340b17).[14]

What Aristotle seems to be suggesting is that our souls and characters are affected by music because our souls contain a harmony too. Our souls "move in sympathy" with the *harmonia* from without, because of a similarity or natural affinity between the structure of the soul and the structure of *harmonia*.

Furthermore, Aristotle, like Plato, believed that music imitates character by imitating those movements that a good person possesses. In the *Politics* he considers why it is that only the objects of hearing have this effect on our characters:

> The objects of no other sense, such as taste or touch, have any resemblance to moral qualities; in visible objects there is only a little, for there are figures which are of a moral character, but only to a slight extent...
> (*Politics* VIII 5, 1340a29-31)

Thus, most objects of sensation don't resemble moral qualities in any way, e.g. the objects of taste and touch. Further, visible objects do so, if at all, only slightly. But even so, he wrote, they cannot imitate character. He made a distinction between signs or indications of moral character and imitations of character. Visible objects can only be signs of character, just as our bodies express or indicate states of inner feeling. Sound, in contrast, does imitate character. Aristotle wrote that "even in mere melody there is an imitation of character, for the musical modes differ essentially from one another, and those who hear them are differently affected by each" (*Politics* VIII 5, 1340a39-41). Rhythm too affects the character, for "some have a character of rest, others of motion, and of these latter again, some have a more vulgar, others a nobler movement" (1340b9-10).

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[14] See also the Aristotelian *Problems* VII.5 where the author wrote that unpleasant sounds create in us a disturbance, a condition of alteration.

This idea of movement is taken further in the *Problems*. Answering the question why audible objects alone possess character, he wrote:

> Is it because that which is heard alone has movement, not, however, the movement in us to which the sound gives rise (for such movement exists also in the other things which affect our senses, for colour also moves our sight), but we perceive the movement which follows such and such a sound? This movement resembles character both in the rhythms and in the melodic disposition of the high and low notes, but not in their commingling; for symphony does possess character...now these movements are connected with action, and actions are indicative of character.
> (*Problems* XIX 27, 919b28-36)

Thus, according to what is written in this passage, sound, like action, sets in us a special movement that we can perceive. This movement resembles character in two ways. On the one hand, it imitates the actions or movements of people through rhythm. This is something we saw in both

Plato and the *Politics* passages. On the other hand, the movement resembles character by means of melodic disposition. This type of movement seems to be related to the harmonization of high and low pitches, and thus it is implied that states of character too involve a ratio of elements in their manifestation. Melody, then, can imitate character by employing *harmoniai* of the high and the low which correspond to certain types of character.

The idea that music, or more specifically *harmonia*, sets up a movement within our souls is taken further by Plato in the *Timaeus*. As in the *Republic*, the soul here is thought to have three parts, but moreover, in the *Timaeus* each part of the soul is thought to have its own motion (*Timaeus* 89e and 90c). A good strong soul has its motions "relatively to one another in due proportion" (90a), whereas a bad weak soul has lost its internal *harmonia*. Music, both melody and rhythm, can help to restore this *harmonia* if it has been lost:

> ...music too, in so far as it uses audible sound, was bestowed for the sake of harmony. And harmony, which has motions akin to the revolutions of the Soul within us, was given by the Muses to him who makes intelligent use of the Muses, not as an aid to irrational pleasure, as is now supposed, but as an auxiliary to the inner revolutions of the Soul, when it has lost its harmony, to assist in restoring it to order and concord with itself.
> (*Timaeus* 47c-d)

Rhythm too was bestowed on humans for the same reason, to help us restore our internal harmony (47e). Because then, there is a similarity between the motions contained in harmony and rhythm and the motions contained within the three parts of the soul, one can affect the other, and indeed, external audible harmonies can help to restore these internal harmonies when they have been disrupted.

It is not, however, just audible *harmoniai* that can affect the soul's motions. As we shall see in the next chapter, Plato envisioned the cosmic soul to be constructed in such a way as to contain harmonious motions. Thus, according to Plato, humans can restore the harmonious motions within their souls by imitating these divine harmonious motions. At *Timaeus* 47c, Plato wrote that "through learning and sharing in calculations which are correct by their nature, by imitation of the absolutely unvarying revolutions of the God we might stabilize the variable revolutions within ourselves".[15] Further, later in the *Timaeus*, is the following passage:

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[15] The idea that the study of the cosmos and unchanging truths will lead to an ordered soul is expressed in the *Republic*, although there is no specific mention of *harmonia*: "The man whose thoughts are truly directed to real existences, Adeimantus, does not have the time to look down upon the affairs of men, and by contending with them to be filled with malice and ill-will. As he looks upon and contemplates things that are ordered and ever the same, that do no wrong to, and are not wronged by, each other, being all in a rational order, he imitates them and tries to become as like them as he can. Or do you think one can consort with things one admires without imitating them in one's own

> ...and inasmuch as he is for ever tending his divine part and duly magnifying that daemon who dwells along with him, he must be supremely blessed. And the way of tendency of every part by every man is one--namely, to supply each with its own congenial food and motion; and for the divine part within us the congenial motions are the intellections and revolutions of the Universe. These each one of us should follow, rectifying the revolutions within our head, which were distorted at our birth, by learning the harmonies and revolutions of the Universe, and thereby making the part that thinks like unto the object of its thought, in accordance with its original nature, and having achieved this likeness attain finally to that goal of life which is set before men by the gods as the most good both for the present and for the time to come. (*Timaeus* 90c-d)

Thus, both audible harmony and the imitation of the divine harmony can affect one's soul. Both *harmoniai* are therapeutic. They are thought to restore the harmony of the inner movements of soul, i.e. restore the due proportion between the motions of each part relative to one another.

Although I shall not, in any great detail, discuss how Plato and Aristotle explained the phenomenon of external *harmoniai* affecting *harmonia* in the soul, I would like to briefly consider the idea that their theories were inspired by the physical phenomena of sympathetic vibrations and resonance. There are two reasons why this is conceivable. On the one hand, the 'ethical' view of music presupposes that sound can affect things at a distance, i.e. the soul

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person?--Not possibly.--So the philosopher, who consorts with what is divine and ordered, himself becomes godlike and ordered as far as a man can, but there is much slander everywhere" (500b-d). Also see *Republic* 529d for the idea that the cosmos falls short of real existences, true speed and slowness, true number and shape.

can be affected by a musician playing the *aulos* from across the room. The phenomena of sympathetic vibrations and resonance both provide physical evidence for the fact that sound can physically affect things at a distance. Furthermore, as we have seen, this ethical view of music presupposes a specific kind of construction of the soul. Likewise, these phenomena can happen only when the responding object is constructed in a particular way. In what follows, I shall briefly explain these two points.

(a) Sound affects things at a distance

Sound is an interesting sort of thing in this context for a number of reasons. Unlike light, sound quite clearly appears to travel. For example, time lags are apparent when a person shouts from a distance, and this was noticed and recorded by ancient Greek authors. For instance, Aristotle wrote that even though we know that an object has been struck, the sound has not yet reached the ear (*De Sensu* 446b6),[16] and in *De Anima*, his theory of hearing depends upon the fact that sound travels through a medium.

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[16] Although considered spurious works, the same idea is expressed in *On Things Heard* 800a1ff., and *On the Universe* 395a16. The latter is particularly interesting as it speaks about why we hear thunder after lightening, even though the lightening occurs after it.

Yet the transmission of sound is invisible; the Greeks never imagined that it was possible to see the movement of sound. Nevertheless, sound quite clearly affects things at a distance. Obviously, it affects us as perceivers, but there were other, slightly stranger effects that the Greeks noticed. For example, they knew about sympathetic vibrations, even though they didn't have a wave-theory of sound. Aristotle asks in the *Problems* the following: "Why, if one strikes *nete* and then stops it down, does *hypate* [which is an octave apart] alone seem to resound?"[17] Furthermore, there are passages in other authors that characterize the concords themselves by the phenomenon of sympathetic vibration:

> Notes are in concord with one another if, when one or the other is struck on a stringed instrument the other one also sounds with it, through some sort of kinship and sympathy...[18]

Therefore, if one string is plucked, another string may start to vibrate with it (if its length is in the right proportion to the sounding string), even though it has remained untouched by any visible object.

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[17] *Problems* XIX.24 (919b15). The same question is asked at 921b15.

[18] The treatise of Adrastus (of Aphrodisias), first part: Theon Smyrn. 51.1-3, as compiled and translated by Barker, p. 214. The same idea is found in the following: "There was a great deal of investigation, beginning initially with the Pythagoreans, and subsequently among specialists in mathematics, as to which ratios they are, in the concordant intervals, in which from notes differing in quality there arises a single blend even when just one of the two strings is plucked, and one which is naturally moved in concordance" (Panaetius: Porph. Comm. 66.16-20, as translated by Barker, p. 238).

In addition, there is evidence that a related phenomenon, resonance, was also known to the Greeks. Aristotle in the *Problems* wonders why it is that newly plastered houses are more resonant, and similarly, houses with wells, cisterns or buried large vessels (XI.7-9). Moreover, Vitruvius, in his *De architectura* gives a recipe for the installation of resonating bronze vases among the rows of theatre seats for the purposes of amplification.[19] Various vases, sized to reverberate with the various fixed notes in a scale, would start to resonate if the singers on stage were to sing the same pitch.

Therefore, both the phenomena of sympathetic vibration and resonance could have served as a physical model of sound or *harmonia* affecting things at a distance.

(b) The construction of the resounding object

In order for sympathetic vibration and resonance to occur, the resounding object must be constructed in a particular way. In both cases, there are structural similarities between the plucked string or sound and the second string or resonating vessel. On one level there is a similitude insofar as there must be the proper ratio between the two objects in order to get the second one going. This would have been apparent most strikingly in the case of the vibrating strings; the passages which speak of sympathetic vibration above all talk about octave intervals which are the ratio 2:1. In the case of resonance, the voices could not have been compared proportionally to the chambers that resonated, however, there was no room for error; either the vessels resonated or not, and the vases specified by Vitruvius would, of course, have been in harmonic ratio with one another.

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[19] Vitruvius *De architectura* Book V, chapter 5, as quoted and translated by John Thorp, "Aristoxenus and the Ethnoethical Modes" in *Harmonia Mundi: musica et filosofia nell'antitichita*, Biblioteca di Quaderni Urbinati di Cultura Classica 5 a cura di Robert W. Wallace e Bonnie MacLachlan, Edizioni dell'Ateneo, Roma (1991): 62.

On another level, there is a material similitude between the original sounding object and the resounding object. This is especially apparent in the case of strings; both are strings, presumably made out of the same material. It is also apparent in Aristotle's stipulation of ideal conditions for auditory perception. Indeed, his theory might well have been entirely inspired by the physical phenomenon of resonance.

What is common to the sounding object, the medium and the ear is that ideally they all are or contain a bounded mass of air. Sounding objects can be just smooth and solid, but "bodies which are hollow owing to reflection repeat the original impact over and over again, the body originally set in movement unable to escape from the concavity" (*De Anima* II 8, 419b16-17).

Sound can travel through an unbounded medium, but because of the 'friability of air', dissipation of the travelling sound inevitably occurs. Sound can only be perceived if this dissipation is delayed, and the most effective preventative in this context is a bounded medium (*De Anima* II 8, 420a7-8).[20]

Similarly, the organ of hearing is again a bounded mass of air:

> The air in the ear is built into a chamber just to prevent this dissipating movement, in order that the animal may accurately apprehend all varieties of the movements of the air outside. (*De Anima* II 8, 420a9-11)

Thus, like sympathetic vibration and resonance, there is both a material and structural similitude between not only the ideal sounding object and ear, but also between the medium and the sounding object and ear.

Further, we also find in Aristotle's theory the idea that sound affects something at a distance; the ear ends up echoing, or resonating the sound that it perceives. Aristotle wrote that a healthy ear "reverberates like a horn" and "we hear with what is empty and echoes".[21] Furthermore, there are special conditions required for hearing; the ear *must* be an enclosed chamber. If it isn't, as would be the case if the tympanic membrane were damaged, hearing would cease (*De Anima* II 8, 420a13). Now, although there are these special conditions necessary for hearing, they are different from the conditions necessary for the resonance of pots. We can perceive many pitches, not just one. Therefore our ears must be capable of resonating with numerous notes or sounds. What this means, then, is that our ears in some ways are like universal vessels, capable of reverberating with any sound that is in the outer air. But, according to Aristotle, ratios are still involved. Each sense organ is a mean or ratio between contraries and is capable of perceiving by the adjustment of this mean or ratio to correspond with the external.[22]

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[20] See also the *Problems* XI 5, 899a20 where the author considers why sounds are more audible at night, and XI 37, 903b13-17 where he considers "why it is easier to hear sounds from outside a house than those from inside a house [when] outside it".

Therefore, there is evidence to suggest that Plato and Aristotle may have used sympathetic vibration and resonance as models for how sound or music can affect one's soul.

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[21] *De Anima* II 8, 420a15-18.

[22] See *De Anima* 424a4, 424b1, 431a11 and 435a21.

These phenomena provided physical evidence for the fact that one harmony can affect another at a distance. Furthermore, this could happen only if certain conditions of similarity (of construction and material) were present between the external and internal. We see both Plato and Aristotle stipulating certain structural and material similitudes between auditory and divine *harmoniai* and the *harmonia* present in the soul.[23]

It is therefore clear that Plato's use of *harmonia* in his theory of soul went beyond its metaphorical employment. Although its political meaning of 'reconciliation' seems to be in the forefront in his discussion of moderation and justice, this use seems to have at its core the underlying presupposition that the soul really does contain a *harmonia* that is analogous, if not identical, to the *harmonia* found in music theory or ontology. This is perhaps most strikingly apparent in the explanation of the cosmos and soul found in the *Timaeus* where both contain a harmony, and one can affect the other because both are constructed in the same way. That this view is also found in the *Republic*, however, is made apparent by Plato's insistence that certain external *harmoniai* should be banned from the ideal city as they will destroy the characters and souls of individuals.

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[23] See also Plato's explanation of sound in the *Timaeus* (67b ff. and 80a ff.).

Through the previous discussion, it has been shown that although soul is a positive attribute of living creatures, because it admits of variety, it is not appropriate to call soul itself a *harmonia*. The good or positive states contained within the soul, however, can be likened to a *harmonia*, and this harmony is closely connected with audible and other physical *harmoniai*.

What then of the opposites employed and the conception of *harmonia*? In the *Republic*, we saw Plato concerned with axiologically unequal opposites--the rational, spirited and appetitive parts of the soul. The good soul strove for the rule of the best of these parts, rationality. *Harmonia* here was used for the most part metaphorically to mean reconciliation and agreement of the part, except in his discussion of Justice. In the case of Justice, Plato likened the *harmonia* present to that found in music (*harmonia*) and medicine (health). We saw, however, that the analogy was a stretch since in medicine the opposites are not axiologically different. Indeed, in medicine, if one opposite is ruling, disease is present. We also saw that his analogy between Justice and musical *harmonia* was a little off since it was unclear how rationality as the leader could fit the analogy.

In the *Timaeus*, the opposites found in the soul are re-characterized in terms of fast and slow motions (67b ff., 80a ff., 89e ff). Therefore, the opposites are non-axiological insofar as they are principles used to explain how a soul can become harmonious, or on the other hand, lose its harmony. While it is true that each part of the soul which is characterized in terms of these movements still corresponds to the *Republic* conception of the soul (as containing the rational, spirited, and appetitive parts), and thus it is still required that the rational part rule over the others, with the *Timaeus* re-characterization of these parts in terms of a quantifiable movement, the harmony contained within the soul and musical harmony are made analogous.

Chapter 6

Cosmological *Harmonia*

It is in cosmology that the use of musical *harmonia* is most well-known. Plato's Harmony of the Spheres in Book X of the *Republic*, and his account of the celestial motions in the *Timaeus* made common the belief that the heavenly bodies were in some way related to music theory. The idea that each planet emits a note of its own came to be accepted to such a degree that explanations had to be sought for why the Greeks couldn't hear this cosmic harmony.[1] Further, what counted as a planet was determined to a degree by how many planets were required for the analogue between cosmology and music theory to hold:

> If any of the celestial phenomena seemed to fail to conform with the numerical principles, [the Pythagoreans] made the necessary additions themselves and tried to fill the gap so as to make their whole treatment of the matter consistent. At least, treating the decad straight off as the perfect number, and seeing that in the visible world the moving spheres are nine in number--seven spheres of the planets, the eighth that of the fixed stars, the ninth the earth (for this, too, they thought, moved in a circle about the resting hearth of the universe, which according to them is fire)--they added, in their system, a counter-earth, which they supposed to move in an opposite direction to the earth, and to be for that reason invisible to those on earth.[2]

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[1] See Aristotle's *De Caelo* II.9, and Plutarch *Quaest. conv.* ix.5.745E.

[2] Aristotle Fragment 203 R3 (Alexander, *Commentarius in Metaphysica* 40.24-33), as translated by Jonathan Barnes and Gavin Lawrence in *The Complete Works of Aristotle, Vol. Two* (ed. Jonathan Barnes) Princeton (1984): 2445. See also Aristotle's *Metaphysics* 986a4-11.

In this chapter I shall examine the role played by musical *harmonia* in two famous cosmological theories. The first is Philolaus's description of the cosmos and the natural world, and the second is Plato's cosmology as found in the *Timaeus*. The theories are similar to each other in a number of ways. Both Philolaus and Plato speak of the same diatonic scale, and in both, this scale was thought to have a cosmic significance. Further, in both there is an epistemological impetus behind the use of musical *harmonia*, as well as the belief that number and *harmonia* brought stability to the relationships or phenomena that they described or regulated.

While there are these similarities, there are, however, important differences between the two employments of musical *harmonia*. In what follows I shall illustrate that while the two theories both use musical *harmonia* as a model or prototype for cosmological *harmonia*, how they do so is different. In general, what one could say is that while they both use musical *harmonia* as a principle, in Plato it becomes more complex in its application, being combined with other principles as well.

(I) Philolaus

As we saw in Chapter 3, Philolaus used the principle of *harmonia* in two different areas of his thought. On the one hand, *harmonia* is found in a musical context, and on the other, Philolaus used the principle of *harmonia* to bring together limiters and unlimiteds in the cosmos. In the musical context, *harmonia* signified a structure, while in the cosmological context, *harmonia* meant that principle which could bring together limiters and unlimiteds into a stable union.

Musical *harmonia*, according to Philolaus, did not so much refer to the individual ratios or concords as to a whole unified structure which was made up of certain privileged ratios. Musical *harmonia*, according to Philolaus, could be understood as the ratio 2:1, but also as the combination of a fifth (3:2) and a fourth (4:3), a fourth and a fifth, two fourths and a tone (9:8), or five tones and two *dieses* (256:243) (DK B6a). Musical *harmonia* was thus a theoretical structure which was made up of these ratios.

Cosmological *harmonia*, on the other hand, served the role of 'cosmic glue' in the thought of Philolaus. According to Philolaus, *harmonia* was that principle that locked together two other cosmic principles: the limiters and the unlimiteds. Although Philolaus refers to these limiters and unlimiteds in a number of places in the fragments,[3] nowhere does he specify in detail what these principles are, nor does he give specific examples of either of them. Perhaps because of this vagueness, scholars have been less apt to give sustained treatments of them.[4] What can be said about them with certainty, however, is that they are two principles which when brought together by the principle of *harmonia* formed all of nature:

> Nature in the universe was harmonised from unlimiteds and limiters, both the whole universe and all things in it.
> (DK B1, trans. Barker)

and,

> ...it is clear that the universe and the things in it are harmonised together from both limiters and unlimiteds.
> (DK B2, trans. Barker)

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[3] See Fragments 1, 2, 3 and 6.

[4] In recent years a few suggestions regarding their nature have been made. For example, Burkert thought that the limiters and unlimiteds correspond to material atoms and the empty spaces between (see pp 258-9 of his *Lore and Science in Ancient Pythagoreanism*), Kirk, Raven and Schofield have suggested that the limiters are odd numbers, and the unlimiteds even numbers (see p. 326 of their *The Presocratic Philosophers*, Second Edition), and Jonathan Barnes argued that Philolaus's limiters are shapes, whereas unlimiteds are stuffs (see pp 387ff. of his *The Presocratic Philosophers*, 2nd Edition, London (1982)). Moreover, there is a pervasive tradition that tends to interpret these two principles in a Platonic/Aristotelian light. According to this interpretation, limiters and unlimiteds are subsumed under the principle of number. They become entirely detached from the phenomenal world and hence are merely the basic principles of number (see Huffman, p. 38). Most recently, Carl Huffman has argued that such things as fire, time, breath and void are examples of unlimiteds, whereas fixed spatial position, i.e. the centre of the universe, or in general, boundaries imposed from without on the unlimiteds, are limiters (see pp 42-44 of his *Philolaus of Croton: Pythagorean and Presocratic*).

These limiters and unlimiteds, therefore, were viewed as primary, and necessary for the formation and continued existence of the universe. *Harmonia* in the cosmos is, then, that principle which 'fastens together' the limiters and unlimiteds. Moreover, as we have seen in Chapter 3, according to Philolaus, cosmological *harmonia* was that principle which could bring together and unify those things that were unlike, unrelated and unequally arranged (*mede isotache*); things that are like and related have no need for *harmonia*. It is only (axiologically different?) opposites that necessarily require the principle of *harmonia* for their reconciliation and their endurance in the cosmos (DK B6).

Therefore, there appear to be two distinct meanings of *harmonia* in Philolaus's philosophy. On the one hand, Philolaus characterized musical *harmonia* as structure--as a composite organization of various ratios and numbers. On the other hand, *harmonia* in the cosmos was a principle that united or 'locked together' limiters and unlimiteds.

Given that Philolaus used *harmonia* in these two contexts, the question arises as to whether there is a parallel between the two uses; what is the connection between musical *harmonia* and *harmonia* as 'cosmic glue'? Was musical *harmonia* meant to serve as the model of the principle of *harmonia* in the cosmos? Or was Philolaus's explication of the musical harmonic structure supposed to be uniquely applied in the realm of music?

There are two things which must be considered in order to answer this question. The first is whether musical *harmonia* too was conceived as a unification of limiters and unlimiteds, i.e. whether there are limiters and unlimiteds in the context of music. This question is important because if there are limiters and unlimiteds in the case of music, then a case can be made that there is an analogy between what musical *harmonia* and cosmic *harmonia* are supposed to do, i.e. bring together and unite these two principles. If musical *harmonia* does not bring together limiters and unlimiteds, but is merely a musical structure, then Philolaus's two uses of *harmonia* are distinct.

The second aspect of Philolaus's thought that is relevant to this discussion is the use to which he put number in both his cosmology and his epistemology. Number was very important for Philolaus for a number of reasons. Not only did he attribute a mystical and cosmological significance to number, as did the earlier Pythagoreans, but for Philolaus, in order for something to be known, it had to have number. Thus, everything that was knowable had a number.

In earlier Pythagorean thought, as we have seen in Chapter 3, those things that had number were thought to have a structure similar to the number that represented and caused them. This was possible because of their belief that numbers have spatial magnitude. Furthermore, the things that had number for these earlier Pythagoreans were few, e.g. justice, *kairos*, marriage, etc. Philolaus, however, thought that everything that was knowable had number, and since presumably more things were knowable than just marriage and the like, more things had to have number in Philolaus's thought than in the thought of the earlier Pythagoreans. Therefore, the question that remains to be answered is how numbers were thought to be present in knowable things when there were not any obvious structural similarities between the object and the number thought to underlie it.

It is my belief that there is evidence to support the view that the use of number in musical *harmonia* was meant to be the model for how number was present in harmonized unities in the rest of the cosmos. Since it is only in Philolaus's discussion of musical *harmonia* that we find an explicit connection made between number, *harmonia* and physical opposites (the high and the low), it is conceivable that musical *harmonia* was meant to serve as the model for how other cosmological phenomena had within them those numerical structures that were necessary for the thing to be known.

In what follows I shall examine each of these points in turn, starting with the question about whether there are limiters and unlimiteds in the context of musical *harmonia*, and then turning to a discussion of the role of number in Philolaus's cosmology and epistemology.

(i) Limiters and Unlimiteds in Musical *Harmonia*

There are two ideas in Philolaus's thought and in the testimonia relating to Philolaus that suggest that musical *harmonia* too was conceived as the reconciliation of limiters and unlimiteds. The first is that Philolaus, in Fragments 1 and 2, specifically writes that *all* things in the universe are either limiters or unlimiteds, or a combination of the two, and thus must be harmonized. It would thus seem that since there is harmonization in the context of music, there are also the principles of limiters and unlimiteds.

This may seem like a trite point, but it points to something that is fundamental in the thought of Philolaus. As we have seen above, it is only limiters and unlimiteds--

things that are unequal in rank, etc.--that require the principle of *harmonia;* things that are equal, like or related have no need for this principle. Therefore, if we do find two or more things being harmonized in a fragment, as we do in the case of musical *harmonia*, it is likely that what are brought together are the limiters and unlimiteds.[5]

The second is that, at least according to Aristotle in the *Metaphysics*, the Pythagoreans grouped together opposite principles into two columns.[6] In these columns, limit is specifically connected with the odd, and unlimited is specifically connected with the even. Since the even and odd play an important role in the composition of the ratios which make up musical *harmonia*, it is conceivable that the odd and even in music are manifestations of the more general principles of limiters and unlimiteds. I shall return to this idea in the following section.

(ii) The Role of Number in Philolaus's Thought

Like the earlier Pythagoreans, Philolaus attributed a mystical, cosmological and epistemological significance to number. The connection between number and knowledge for Philolaus, however, was less mystical than earlier uses and was not linked explicitly with Apollo, the Sirens or prophesy.

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[5] See Huffman, p. 41.

[6] *Metaphysics* I 5, 986a22-26. The passage reads as follows: "Other members of this same school say there are ten principles, which they arrange in two columns of cognates--limit and unlimited, odd and even, one and plurality, right and left, male and female, resting and moving, straight and curved, light and darkness, good and bad, square and oblong".

The ideas that emerge from Philolaus's epistemological fragments are that (1) in order for something to be known, it must have number, (2) there are three kinds of number, the even, the odd and the even-odd, and (3) each thing indicates which of the three kinds of number that it has. First then, and perhaps in answer to the Parmenidean problem that nothing in the changeable physical world is knowable, Philolaus thought that number is necessary for knowledge. This idea is apparent in Fragment 4:

> And indeed all the things that are known have number (*panta...ta gignoskomena arithmon echonti*). For it is not possible that anything whatsoever be understood (*noethemen*) or known (*gnoethemen*) without this.[7]

Furthermore, the last two ideas emerge from Fragment 5:

> Number, indeed, has two kinds peculiar to it, odd and even, and a third derived from the mixture of the two, even-odd. Each of the two kinds has many forms, which each thing in itself indicates.[8]

Thus it appears that underlying knowable objects there were, for Philolaus, numbers or 'forms' of numbers. The physical world contains manifestations of these underlying numbers, either the odd, the even or the even-odd, for everything that is knowable must have number.

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[7] DK B4 (Stobaeus, *Eclogae* I.21.7b), as translated by Huffman, p. 172 (Carl Huffman, *Philolaus of Croton: Pythagorean and Presocratic*, Cambridge (1993)).

[8] DK B5 (Stobaeus *Anth*. 1, 21, 7c), as translated by Kirk, Raven and Schofield, p. 326.

I have argued in Chapter 3 that the Pythagoreans used number in a way very different than our own. Numbers were conceived as having spatial magnitude and as having various structural characteristics which, when similar to the structure of physical substances, were thought to underlie or be the principle or cause of these substances. Thus, to have number meant more than to be countable; having number (*arithmos*) is equivalent to saying "having an order or structure that can be specified in terms of the relationships between numbers" (Huffman p. 70).

Philolaus's use of number is not significantly different from this early usage. Thus, by stipulating that number is necessary for knowledge, Philolaus is saying that the object of knowledge must have such a structure which is similar or identical to the structures found in number. And by knowing and understanding this structure and the relationships that hold between a physical substance's various parts, one indeed knows quite a lot about it.[9]

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[9] Furthermore, as was shown in the examination of the early Pythagorean *akousma*, even in earlier Pythagorean thought, number was connected with knowledge.

A question, however, remains about Philolaus's epistemology. The earlier Pythagoreans purportedly only gave number to a few sensible substances which bore a resemblance to the structure of the number with which they were identified. Philolaus, however, thought that everything that was knowable had number. Since presumably more things were knowable than just marriage, justice and the like, more things had to have number in Philolaus's thought than in the thought of the earlier Pythagoreans. The question that remains to be answered is how numbers were thought to be present in knowable things when there were not any obvious structural similarities between the object and the number thought to underlie it.

I shall attempt to argue that Philolaus made the connection between number and knowable objects by means of the connection between number and musical *harmonia*. Because all things in the universe are either limiters or unlimiteds which are harmonized together, and in music, *harmonia* is the bringing together of the high and the low which are represented by means of two numbers, the odd and the even, musical *harmonia* may have served as the model for how number was meant to be present in knowable things, i.e. number (as a structure) came to exist in physical things that had been harmonized. In what follows I shall attempt to elucidate this connection between musical *harmonia* and number. It is my belief that musical *harmonia* served as the model for the connection between number and cosmological *harmonia*, since it provided physical evidence that the harmonization of two or more things gave number to the resultant unity.

How number is connected with musical *harmonia* is through the numbers which are contained within the ratios that make up this sort of *harmonia*. As we have seen, musical *harmonia* is a complex set of ratios, each of which is made up of two numbers. *Harmonia* is either the ratio 2:1 or other smaller ratios which, when multiplied together, have a product of 2:1.

As I have previously mentioned, it is conceivable that the limiters and the unlimiteds in music were the odd and the even. I would now like to argue this in more detail. Musical *harmonia* is a composite structure made up of various concords that can be represented by means of ratios. For example, *harmonia* or the octave is the ratio 2:1, or the combination of smaller concords which are also ratios (i.e. 3:2 and 4:3, 4:3 and 3:2, 4:3 and 9:8 and 4:3, etc.). One notices that both the ratio of the octave itself and the ratios of the smaller concords include one odd number and one even number. Furthermore, the difference between the terms is one unit, i.e. n+1:n.

This sort of ratio, in which the difference between the two terms is one unit, and thus one term was odd and the other even, was significant to some Pythagorean musical theorists. It was called epimoric ratio. The significance attributed to this kind of ratio is especially manifest in the musical theory of Archytas. Indeed, Archytas believed it so theoretically important that he was considered "patently out of tune with what [had] already been straightforwardly accepted by the senses".[10] He gained this reputation because of his divisions of the scale; although they were theoretically parsimonious and elegant, they would not have sounded as pleasing as other divisions. For example, unlike Philolaus (and as we shall see Plato)--who divided up the octave into the following (diatonic) interval series: 9:8, 9:8, 256:243, 9:8, 9:8, 9:8, 256:243--Archytas divided it up so that the one non-epimoric ratio, i.e. 256:243, was eliminated. His series was as follows: 9:8, 8:7, 28:27, 9:8, 9:8, 8:7, 28:27;[11] every interval was thus described by means of epimoric ratio. Therefore, the numbers contained in the ratios that make up musical *harmonia* are theoretically significant. They are ideally epimoric and thus will always have one term that is odd and one that is even.[12]

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[10] Ptolemy *Harm.* 30.9-31.18 (DK A16), as translated by Barker pp 43-44.

[11] The condition that musical intervals should be epimoric is also satisfied by Archytas' divisions of the enharmonic scale. According to Ptolemy, Archytas' interval series in this genus was 5:4, 36:35, 28:27, 9:8, 5:5, 36:35, 28:27 (Ptolemy, *Harm.* 30.9-31.18, as found in Barker pp 43-44). Archytas' chromatic interval series, however, does contain non-

That a later Pythagorean gave such theoretical significance to epimoric ratio in musical *harmonia* is, I believe, telling. While there is no evidence to suggest that Philolaus formulated a definition of epimoric ratio or believed it to be at all theoretically significant, the fact that Archytas believed it to be so important suggests the following. (1) It is likely that the Pythagoreans in general, and Archytas specifically, believed there to be either a criterion or a set of criteria which distinguished those ratios that were appropriate for describing musical concords from those that were inappropriate. Indeed, this clearly comes out of the Pythagorean tradition which links the ratios underlying the musical concords with the numbers found in the *tetraktys* of the decad. (2) Given that

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epimoric ratios. But, as some scholars have noticed (e.g. van der Waerden pp 181-7 and Barker p. 47), although this genus contains intervals that are not of epimoric ratio, it is possible to construct every single note by means of "movements through intervals whose ratios are epimoric" (Barker p. 47). Moreover, all of the numbers contained within these epimoric ratios are below the number 10.

[12] The one ratio that is not epimoric in Philolaus's musical *harmonia* is the *dieses* or, as Plato called it the *leimma* or remainder. But although it is not epimoric (it is not of the form n+1:n), it is still made up of one even number and one odd number.

Archytas chose as his distinguishing criterion that the musical ratios be epimoric, and this criterion is not apparent in any earlier Pythagorean thought, it seems very likely that some part of his definition was rooted in the pre-existing criteria of the musical ratios.

We have seen that Philolaus, at least, attributed to the even and the odd some significance. In Fragment 5, Philolaus wrote that there are three kinds of number, the even, the odd and the even-odd. What is more, in his discussion of musical *harmonia*, all of the ratios that are discussed are made up of one odd number and one even number. It seems conceivable to me that for Philolaus, a de facto criterion of musical ratios was that they be composed of one odd number and one even number. Archytas, tightening the requirements for these musical ratios stipulated that they be epimoric. While it is not part of the definition of epimoric ratios that they be composed of one odd and one even number, it is a property of epimoric ratios that they be so composed; that one number is odd and the other is even is a feature of epimoric ratios that will always be present, although it is not, strictly speaking, part of the definition.

Therefore, it is my belief that what was an essential feature of the musical ratios in the thought of Philolaus came to be a property of musical ratios in the thought of Archytas, i.e. in virtue of the fact that the ratios were defined as n+1:n. Why Archytas would have tightened the criterion of these ratios no doubt comes from his tendency to put mathematical simplicity before any other theoretical (or, for that matter, aesthetic) virtue.

It is thus conceivable that for Philolaus what was brought together in the case of musical *harmonia* was the even and the odd, and since everything that is harmonized in the thought of Philolaus is unlimiteds and limiters, it is conceivable that the even and odd were particular manifestations of these general principles. Indeed, this point is supported by Aristotle's record of the association between even and odd numbers and unlimited and limited in the *Metaphysics* (I 5).

Furthermore, at a more basic level, what are harmonized in music are physical objects. Every ratio in musical *harmonia* is a ratio between two things; the ratios represent intervals between two notes, and these notes (a high note and a low note) were represented by various string lengths. For example, the octave, which is the ratio 2:1, is a ratio between two lengths of string, one, say, 12 units long, and the other 6 units long. The string of length 12 will sound an octave lower than the string of length 6.

Thus, the ratios in music which are composed of one odd and one even number represent the high and the low insofar as the odd and the even represent string lengths which when plucked will produce one high note and one low note.[13] The axiologically loaded even and odd, unlimiteds and limiters, thus represent the non-axiological opposites high and low.

Therefore, in Philolaus's music theory, we find a connection between number, *harmonia*, unlimiteds and limiters, and actual physical objects. Musical *harmonia* was the bringing together of the even and odd (which were particular manifestations of the general principles of unlimiteds and limiters). Thus what was harmonized was number. These numbers, however, were representative, or were thought to underlie, actual physical phenomena--the high and the low. Thus harmonization in music was not only the bringing together of limiters and unlimiteds, but it was specifically the bringing together of sensible substances that acquired number through the resultant harmonic structure. The high and the low acquire number by being compared to one another or brought together into a ratio.

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[13] There is, however, no fixed connection between the even and the low and the odd and the high (as there may seem to be if one examines only the ratio 2:1 which underlies the octave--2 (even) represents the low and 1 (odd) represents the high). For example, the odd and even numbers that make up the concord of the fifth (3:2) will represent the low and the high respectively--3 (odd) represents the lower note, and 2 (even) represents the higher note.

Does, then, musical *harmonia* serve as the model for *harmonia* as a unifying principle in the rest of Philolaus's cosmos? An answer to this question can now be given. That it is conceivable that musical and cosmological *harmonia* were meant to be analogous is shown by the following two points. On the one hand, as we have seen, it seems likely that the principles of limiters and unlimiteds are manifest in musical *harmonia* as the odd and the even. Thus both *harmonia* in music and cosmic *harmonia* were meant to unify similar sorts of things, i.e. limiters and unlimiteds, in one guise or another.

On the other hand, since it is only in musical *harmonia* that there is an explicit connection between physical object, number, and *harmonia*, and since Philolaus gave number such an important role in his epistemology, this connection (between physical objects and number) in music theory is significant. Philolaus believed that in order for something to be known, it had to have number. But it is only in musical *harmonia* that we find an example of the underlying numbers of physical objects. In the case of music, physical objects acquired number by being harmonized--by being brought into a structural relationship with one another by means of the principle of *harmonia*. Because the whole universe and everything within it are also harmonized out of limiters and unlimiteds, it is conceivable that Philolaus believed that here too it was their harmonization that gave them number--gave them a structure that was analogous to the structure found in musical *harmonia*.

Therefore, it appears that the harmonization of the high and low in music was meant to be the prototypical example of the acquisition of number for all cases of harmonization of unlimiteds and limiters. Once the limiters and the unlimiteds in the cosmos had been brought together by the cosmic principle of *harmonia*, they had been structured in a way that was supposed to be roughly analogous to the structure found in musical *harmonia;* by means of this imposition of structure, they acquired number. Each thing, e.g. an unlimited, that was harmonized, was placed in a stable relationship with another thing, i.e. a limit, and perhaps stability was produced, in part, by the imposition of number. Therefore, by means of mathematical structure and number, physical objects and phenomena were knowable. Understanding is thereby achieved when one comprehends the underlying structure inherent in these *harmoniai*.

Previous to Philolaus, the Pythagoreans knew about the ratios that underlie the musical consonances and they had already given *harmonia* a cosmic significance. Philolaus seems to have filled out these ideas and given a more detailed exposition of how this cosmic significance was to be understood. He used the system of ratios that underlie the musical concords as the prototype of *harmonia* in the rest of the cosmos, but generalized from the specific things involved in the harmonization of music (even/odd which represent high/low) to the principles of unlimiteds and limiters. The evidence for this claim is perhaps most compellingly manifest in the fact that number is acquired through the harmonization of the unlimiteds and limiters. In musical harmonization this is strikingly apparent, since the ratios, which are the expression of this *harmonia*, are composed of two numbers, one odd and one even which stand for the physical high/low. One can thereby understand musical *harmonia* by examining and thus understand the ratios that make up the octave. How number was supposed to underlie the other physical substances that make up the world was supposed to follow this model. We are to understand the cosmic principle of *harmonia* by means of the prototype manifested most perfectly in the octave.

(II) Plato's *Timaeus*

That Plato's *Timaeus* owes a great debt to Pythagorean philosophy is a fact that has been recognized almost since it was written. Indeed, the tradition from the Old Academy equates Pythagorean philosophy with the doctrines of the *Timaeus*.[14] Although there are certainly echoes of Pythagorean doctrine in the *Timaeus*, there are also important differences between the two. For instance, although both the early Pythagoreans and Plato use musical *harmonia* as a model for cosmological *harmonia*, how it serves as this model is not the same in both. Furthermore, as with Philolaus, there was a strong epistemological impetus behind Plato's use of *harmonia*, but again, there are also important dissimilarities between the two theories.

What I would like to determine is exactly how Plato used musical ontology in his cosmological account. What shall emerge is that Plato used the harmonic octave structure as an analogue for cosmic *harmonia* in a way that was different than Philolaus's. For Plato, it is proportion that is more relevant to cosmic unity than the particular ratios that make up musical *harmonia*. And this should not be surprising to us. Plato believed numbers to be abstract entities that existed in an ideal realm. Therefore his use of number was very different than those early Pythagoreans who believed number to have spatial magnitude. Thus, number and *harmonia* qua structures would not have been in the forefront of Plato's mind.

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[14] Burkert *Lore and Science in Ancient Pythagoreanism* p. 85.

Plato does, however, use the same musical scale that was described by Philolaus in Fragment 6a. Further, the scale is given a cosmic significance in Plato's thought as well. But as shall be shown by what follows, Plato was not primarily concerned by musical considerations. Instead, his goal was to provide a mathematical structure to the cosmos which was analogous to the mathematical structures found in the body and the soul. This mathematical structure had more to do with the three means--arithmetic, geometric and harmonic--than it had to do with Pythagorean music theory.

Plato's ultimate goals, however, were similar to those of Philolaus. Plato's use of these three means was meant to safeguard stability in the cosmos. Similarly, Philolaus thought that cosmic *harmonia* 'locked together' the limiters and unlimiteds. Furthermore, Plato's use of number in the *Timaeus* was partially motivated by epistemological concerns. As we have seen, Philolaus thought that everything that was knowable had number.

Therefore, there are similarities between the use of number and *harmonia* by Plato and Philolaus, but there are also differences. In what follows, I shall work through Plato's account of the cosmic body and the cosmic soul in order to show how he used proportion and musical *harmonia*. What shall emerge from this discussion is that Plato's use of both were motivated by concerns outside the musical domain. I shall then examine the context of Plato's cosmic scale in order to illustrate (1) that Plato was more concerned with giving the cosmos stability by means of the three means than he was with making the analogy between musical and cosmic *harmonia* consistent, (2) that Plato's epistemological concerns also figured in his use of *harmonia* and number in the cosmos, and (3) like Philolaus, the opposites employed by Plato were primarily axiologically different from one another, but they could also represent physical non-axiological opposites.

In the *Timaeus*, Plato treats the cosmos as if it were a living creature, a copy, made by the Demiurge (28c), of the eternal intelligible creature: "It has been constructed after the pattern of that which is apprehensible by reason and thought and is self-identical" (*Timaeus* 29a). The Demiurge took all that was visible, and seeing that it was "not in a state of rest but in a state of discordant [*plemmelos*] and disorderly [*ataktos*] motion, He brought it into order out of disorder, deeming that the former state is in all ways better than the latter" (30a). This orderly state amounted to a universe constructed on the model of a divine living being, endowed with both body and soul (30b-d). Both of these components of the cosmos--both its body and soul--make use, in varying degrees, of Pythagorean musical ontology.

Timaeus says that the cosmos needs a body--fire for visibility and earth for solidity (*Timaeus* 31b). Since, however, two things cannot be joined without a third intermediary bond, and this must be proportion,[15] the Demiurge put water and air inbetween fire and earth. Plato wrote the following:

> ...having bestowed upon them so far as possible a like ratio one towards another--air being to water as fire to air, and water being to earth as air to water,--he joined together and constructed a Heaven visible and tangible. For these reasons and out of these materials, such in kind and four in number, the body of the Cosmos was harmonized by proportion and brought into existence. These conditions secured for it Amity, so that being united in identity with itself it became indissoluble by any agent other than Him who had bound it together. (*Timaeus* 32b-c)

Although Plato may be here referring to all proportion (i.e. geometric, arithmetic and harmonic),[16] he may have in mind only geometric proportion.[17] For example fire is to air, as air is to water, as water is to earth, can be represented as 1:2::2:4::4:8 (using the series in the power of 2).

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[15] Plato writes that "the fairest of bonds is that which most perfectly unites into one both itself and the things which it binds together; and to effect this in the fairest manner is the natural property of proportion" (31c).

[16] See A.E. Taylor's *Commentary on Plato's Timaeus* (Oxford, 1928): 96.

Furthermore, the harmonization of the four elements is meant to be exhaustive; the Demiurge left over "no single particle or potency of any one of these elements" (*Timaeus* 32c). By exhausting the supply of elements, the Demiurge guaranteed that no other like creatures could come into existence (32d), and the cosmos could not be affected or corrupted by anything from without:

> He perceived that when heat and cold, and all things which have violent potencies, surround a composite body from without and collide with it they dissolve it unduly and make it to waste away by bringing upon it ailment and age.
> (*Timaeus* 33a)

After giving the cosmos body, the Demiurge went on to generate the world-soul (*Timaeus* 35b-36b). Out of a finite and definite mixture of Being, Same and Other, the Demiurge took certain portions which eventually exhaust this mixture. Where music theory fits into this is in the types of portions which are taken and the end result of a musical scale.

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[17] In the *Gorgias* 508a, Plato writes that "heaven and earth and gods and men are held together [*sunechein*] by communion and friendship, by orderliness, temperance, and justice; and that is the reason, my friend, why they call the whole of this world by the name of order [*cosmos*], not of disorder or dissoluteness. Now you, as it seems to me, do not give proper attention to this, for all your cleverness, but have failed to observe the great power of geometrical equality [*he isotes he geometrike*] amongst both gods and men...". Cornford believes that geometrical proportion is the proportion *par excellence* (see *Plato's Cosmology* London (1937): pp 44-45). See also Theodore Tracy's *Physiological Theory and the Doctrine of the Mean in Plato and Aristotle,* The Hague (1969): 79 n.5.

This passage (*Timaeus* 35b-36b) may be divided into three different sections. Each reads as a separate step that the Demiurge took in generating the World-Soul; from the above mentioned mixture of Being, Same, and Other, to the end result of a musical scale. The first is the description of the seven original portions that the Demiurge took from the mixture, corresponding to the powers of two and three, the second step involves taking more portions from the original mixture, corresponding to the arithmetic and harmonic Means in order to fill up the intervals between these seven original portions, and the last step describes taking further portions from the mixture in order to fill up certain larger intervals that still remain.

The first seven quantities that the Demiurge removed were the quantities of 1, 2, 3, 4, 8, 9, and 27. These numbers are actually members of two different series, the series of the power of two, and the series of the power of three--the two series being 1, 2, 4, 8, and 1, 3, 9, 27, the number 1 being common to both. The relationship between the numbers is geometric. The geometric mean is described by

Archytas[18] in the following way: "There is a geometric Mean when [three terms] are such that as the first is to the second, so is the second to the third". Thus, the relationship between the terms in the series of the power of two is geometrical insofar as the second term is always double the first. Similarly, in the second series, the relationship is again geometric, but the second term is triple the first.

Two points need to be made here. The first is that it is important to remember that the Greeks worked with string lengths, not frequencies. Because of this, a higher number will correspond to a lower note. Thus, a given string will be an octave higher than a first by being halved. Of course, this corresponds to twice the frequency, but that was not known.

The second point that needs to be emphasized is that the geometric series of the power of 2 corresponds to octaves. For example, a string with length 2 will be an octave lower than the string of length 1, 4 will be an octave lower than 2, and 8 an octave lower than 4. The result of Plato's step one, then, is seven different quantities or portions, some of which (those in the series of the power of two) have intervals that correspond to octaves.

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[18] Frag. 2 (Porph. *Comm.* 93.6-17), as quoted and translated by Andrew Barker, *Greek Musical Writings II: Harmonic and Acoustic Theory*, Cambridge (1989): 42.

Plato then wrote (*Timaeus* 36a1-7) that the Demiurge went on to fill up these intervals (those in the series of the power of 2 and of 3) with portions which correspond to two Means, the harmonic and the arithmetic. Thus, between 1 and 2, there will be placed two new portions whose lengths are determined by Means which are characterized by certain mathematical formulae. The harmonic Mean is defined by Plato as follows: "a Mean which exceeded its Extremes and was by them exceeded by the same proportional part or fraction of each of the Extremes respectively" (*Timaeus* 36a3-5). In other words, if we have two string lengths, 6 and 12, and we wish to determine the harmonic Mean between them, what we need to find is a number which exceeds 6 by a part of 6 which is equal to the part of 12 which it is exceeded by 12. As Nicomachus writes, "the number 8 is a Mean in harmonic proportion between 6 and 12, exceeding 6 by one third of that 6 [sc., 2], and exceeded by 12 by one third of that 12 [sc., 4]".[19] Thus if we concentrate for the moment on the series of the power of 2, the new portions generated will be of the following lengths: in between 1 and 2 will the be length 4/3; between 2 and 4 the length 8/3; and between 4 and 8 the length 16/3.

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[19] *Enchiridion*, 250.13-14, as found in Barker: 260.

The arithmetic Mean is generated by taking a length which exceeds one extreme by the same number or integer as it is exceeded by the other extreme (*Timaeus* 36a6-8). Thus, the arithmetic Mean between lengths 1 and 2 will be the length 3/2, between 2 and 4 the length 3, and between 4 and 8 the length 6.

So far we have only been dealing with the portions in the series of the power of 2. I will defer treating the series of the power of 3 for the moment to look at the ratios that have so far been generated. We know that the geometric series of the first step produced three octaves, but what is important to realize is that the lengths of string generated by the harmonic Mean stand in the ratio 4:3 to the lesser extreme and in the ratio 3:2 to the greater extreme. Furthermore, the lengths of string generated by the use of the arithmetic Mean stand in the relation 3:2 to the lesser extreme and in the ratio 3:4 to the greater extreme. The ratio between the two Means themselves is 8:9. Thus, the same relations that are found in Philolaus's Fragment 6a (minus the intervening intervals) have been generated here, and the intervals that Plato describes the

Demiurge as having produced are the fourth (4:3), fifth (3:2), and the tone (9:8).

The third step made by the Demiurge is described by Plato as follows:

> He went on to fill up the 4:3 intervals with 9:8 intervals. This still left over in each case a fraction, which is represented by the terms of the numerical ratio 256:243.
> (*Timaeus* 36a7-36b6)

What Plato is describing is the use of the interval 9:8 as generated from the ratio underlying the difference between the harmonic and arithmetic Means in step 2, to fill in the intervals between the extremes and the Mean(s) closest to it (and as we have already seen, all of these intervals are in fact 4:3). Thus, to move to the third step, we must fill in these 3:4 intervals with two portions, the first standing in the relation of 8:9 to the 3 (of the 3:4) and then a second standing in the relation 8:9 to the new note generated. These intervals of 8:9 roughly correspond to our tone. And further, as Plato wrote, in each case a fraction remains which may be represented as the ratio 256:243. In Greek musical writings, this ratio is referred to as a *leimma* or remainder (a *diesis* in Philolaus), and mapping this ancient tuning system onto our own, what corresponds to this interval is very roughly our semi-tone.

Therefore, from these three steps, Plato has generated a series of intervals corresponding to the intervals found in a musical scale and found in Philolaus's Fragment 6a--all this from the series of the power of 2. What function, then, does the series of the power of 3 serve? In what follows I will demonstrate that this series generates a series of pitches that are different at some points from the series generated from the power of 2. This fact has not in the past been recognized, and as the series from the power of 2 is an elaboration on certain Pythagorean musical doctrines, it is likely that Plato's inclusion of the series from the power of 3 was motivated by non-musical considerations.

Moving back to the first step, the string lengths generated from this series are 1, 3, 9, 27. Unlike the interval generated in the series of the power of 2 (the octave), in this series the interval between each of these notes is a twelfth. This interval, other than being a compound of an octave and a fifth, has no particular significance in music theory.

Following Plato, let us proceed to the second step which requires the calculation of the harmonic and arithmetic Means between these quantities. The series that results is 1, 3/2, 2, 3, 9/2, 6, 9, 27/2, 18 and 27. Therefore, up through the length 6, the series of the power of 3 maps onto the notes generated by the application of the three steps to the series of the power of 2. In other words, no 'new' notes are generated. For instance, string-length 2 was generated in the power of 2 series from the first step, lengths 3/2, 3 and 6 were generated with the application of the arithmetic Mean of the second step, and length 9/2 was generated in the third step and stand in relation 8:9 to length 4. So far, so good. However, the intervals generated between these quantities or pitches are a fifth, fourth, fifth, fifth, fourth, fifth, fifth, fourth, fifth. Thus, the interval representing a tone is not generated from this series, as it was with the application of the second step to the series of the power of 2. But that Plato realized this is clear from the sentence which follows the second step. It reads:

> And whereas the insertion of these links formed fresh intervals in the *former* intervals, that is to say, intervals of 3:2 and 4:3 and 9:8....
>
> (*Timaeus* 36a7-9, my italics)

It is only from the series of the power of two that the tone is generated which is necessary for the third step.

Now we must discern whether the third step can be applied to the series of the power of three. Plato does not say what we are to do with the filling of the intervals of 3:2 which might lead one hesitantly to conclude that we are not meant to apply the third step to this series. But there are three tetrachords or intervals of a fourth (4:3) which

Plato does say to fill in with 9:8 intervals. So, let us proceed to see what results. The first interval of a fourth is between lengths 3/2 and 2. If we insert the 8:9 intervals here we have a direct mapping onto the lengths generated from the series from the power of 2. If, however, we move to the second interval of a fourth, we run into some problems. This interval is found between lengths 9/2 and 6. If we follow Plato's instructions, the new lengths generated are 81/16 and 729/128. Length 81/16 does map onto the previous series as it was generated from the third step in the power of 2 series. However length 729/128 was not generated by any of the three steps. The nearest length to it is 16/3 which is close to a *leimma* higher than length 729/128. Furthermore, if we were to extend the power of 2 series up to string length 27, we would find that the third fourth in the power of 3 series equally fails to map onto the power of 2 series. In the former we have string lengths 27/2, 243/16, 2187/128 and 18, and in the latter series we have string lengths 27/2, 243/16, 16, and 18.

Now, in both of these intervals the discrepancy involves notes that are generated from the first two steps as applied to the power of 2 series. These notes are more fundamental than those generated in the third step in that they stand in relation to other notes by way of purer ratios, i.e. either 1:2, 2:3 or 3:4. Therefore, it is impossible that they could be classified as moveable notes in standard Greek musical terminology, as they are part of the structure which is immovable.[20] Thus, it seems that either Plato did not intend for us to fill in the 3:4 intervals in the power of 3 series, or if he did, he did not work through it carefully enough to realize that a discrepancy would result.

To my knowledge, commentators on this passage of the *Timaeus* have never noticed this discrepancy. For instance Francis Cornford writes that the process of filling in the tetrachords as specified by step 3, "continued throughout the remaining tetrachords, completes the whole range of notes from 1 to 27",[21] seemingly not noticing that there are not enough tetrachords or intervals 4:3 from string length 9 to 27 to completely fill in all the intervals with tones or *leimmata*. Similarly, A.E. Taylor writes that the number of terms in the completed series is 34, which implies that intervals of 9:8 and *leimmata* are inserted throughout.[22]

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[20] In Aristoxenus' discussion of moveable and non-moveable notes, the fourth, fifth and octave above a given note (C, G, F, C') are the non-moveable notes, and the intervals between C and G, for instance, may be varied according to varying genera. However C, G, F, and C' cannot be varied and so remain constant from genus to genus.

[21] Cornford, Francis *Plato's Cosmology*, New York (1937): 72.

[22] Taylor, A.E. *A Commentary of Plato's Timaeus*. Oxford at the Clarendon Press (Oxford, 1928): 142-145.

Furthermore, Taylor, commenting on an interpretation of this passage by Proclus, admits confusion over string length assignments between lengths 9 and 27.[23] This suggests one of two things: either Proclus was genuinely confused, or else he was aware of this discrepancy and, by trying to accommodate it, assigned different string lengths to certain notes in the range between lengths 9 and 27.

What these discrepancies suggest is that Plato did not intend for the third step to be applied to the power of three series, nor did he intend for the power of two series to be extended as far as 27.[24] If the claim that music theory serves as an analogue or theoretical framework for the unknown is taken seriously and applied carefully, then we need to look more closely at the context of the passage in the *Timaeus*, and determine what it is that Plato is trying to accomplish by his use of music theory.

If it were the case that Plato was only trying to generate a musical scale in this passage, then it is unclear why he began with the two geometric series 1,2,4,8 and 1,3,9,27. Indeed, all of the musical intervals contained in a musical scale (e.g. octave, fifth, fourth and tone) can be generated by the simple arithmetic series 1,2,3,4, which is contained in the *tetraktys*.[25] It is clear then, that his choice to include these two geometric series was governed by non-musical considerations.

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[23] Taylor, 143-145.

[24] I owe Brian Fogelman, McGill University, a great debt for his penetrating comments on an earlier version of this section of my thesis.

As we have seen, the world soul is supposed to animate the cosmic body, which is composed of four elements which stand in certain proportions to each other. Because the body of the cosmos is obviously three-dimensional, it is necessary that there be two middle terms in the proportions:

> Now if the body of the All had had to come into existence as a plane surface, having no depth, one middle term would have sufficed to bind together both itself and its fellow-terms; but now it is otherwise: for it behoved it to be solid of shape, and what brings solids into unison is never one middle term alone but always two. (*Timaeus* 32a-b)

Two mean terms are required for a continuous proportion of "solid" or cubic numbers, for example a3:a2b::a2b:ab2:: ab2:b3.[26] Prima facie, this would provide Plato with a reason for picking the power of two and the power of three series, since both series terminate in cubic numbers--specifically, the cubes of the first even and the first odd numbers respectively.

Furthermore, it is important to remember the cosmological function of proportion in the *Timaeus*. By starting with 1,2,4,8 and 1,3,9,27, Plato has introduced geometric proportion into his account. If the simple arithmetic series 1,2,3,4 was chosen as the starting point for the divisions, the geometric proportion would be absent from the account. Utilizing the two geometric series has thus allowed Plato to make use of all three types of proportion--geometric, arithmetic and harmonic--hence giving the world soul the maximum amount of unity.

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[25] See Chapter 3.

[26] See R.G. Bury's note 3 on page 59 of the Loeb Plato IX *Timaeus, Critias, Cleitophon, Menexenus, Epistles*.

One must also not forget Plato's astronomical concerns in this passage. Immediately following the passage under consideration, Plato describes the Demiurge splitting the world soul into two parts which he laid across each other and formed into two circles (*Timaeus* 36b-d). These two circle-strips He set into motion, the outer circle with the motion of the Same, and the inner circle with the motion of the Other. The Demiurge then went on to divide this inner circle six times according to the now familiar double and triple intervals (2,4,8 and 3,9,27). The aim of these latter divisions was to provide an orbit for each of the seven heavenly bodies recognized as planets--the Sun, Venus, Mercury, Moon, Mars, Jupiter and Saturn (38c-d). Thus we can see that Plato's motivation for choosing the two series was governed too by the need to provide seven orbits for the planets.

Finally, there are important epistemological and ontological considerations which must be taken into account to fully understand Plato's cosmological theory. Part of the impetus behind Plato's choice for a mathematical basis of the cosmos is that (1) number provides stability since it is incorporeal and unchanging and not part of the physical world as such, and (2) as in Philolaus, number is, in some way, necessary for knowledge. Immediately proceeding the passage in which Plato describes the motions of the circles, he concludes his discussion of the world soul by writing that (a) the world soul "began a divine beginning of unceasing and intelligent life lasting throughout all time" (*Timaeus* 36e), (b) this soul is "invisible but partakes in reasoning and harmony (*harmonias*), having come into existence by the agency of the best of things intelligible and ever-existing as the best of things generated" (*Timaeus* 37a), and (c) because the world soul is a proportionate blend of Same, Other and Being, whenever [she] comes into contact with anything, [she] is able to "announce what the object is identical with and from what it is different, and in what relation, where and how and when, it comes about that each thing exists and is acted upon by others both in the sphere of the Becoming and in that of the ever-uniform" (*Timaeus* 37a-b). Whenever the announcement is concerned with the sensible world, true beliefs arise, and when it is concerned with the rational "and the circle of the Same, spinning truly, declares the facts, reason and knowledge of necessity result" (*Timaeus* 37c).

The soul of the cosmos is thus intelligent and "partakes in reasoning". Furthermore, her knowledge is explained in (c) on the basis of a like-by-like model of knowledge acquisition. By making both the body and the soul analogous insofar as they are both made up of proportion, and by making the soul contain the principles of Being, Same and Other, Plato is able to explain how the cosmic soul can gain knowledge.

Furthermore, since the cosmic body and soul are also supposed to serve as the divine model for human bodies and souls, Plato is able to explain how humans acquire knowledge of both the physical world, and also number and harmony.[27] As is recorded by Theon of Smyrna, Adrastus wrote of Plato the following:

> ...Plato has an eye to nature, since it is necessary that the soul, being constituted in accordance with *harmonia*,

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[27] For example, Plato wrote: "And in order that there might be a clear measure of the relative speeds, slow and quick, with which they travelled round their eight orbits, in that circle which is second from the earth God kindled a light which now we call the Sun, to the end that it might shine, so far as possible, throughout the whole Heaven, and that all the living creatures entitled thereto might participate in number, learning it from the revolution of the Same and Similar." (39b) Plato also discussed (*Timaeus* 47c ff, 80b, 90c-d), why and how the motions of human souls should imitate the motions of the cosmic soul. For a further discussion of this, see Chapter 5.

> should advance as far as the solid numbers and be attuned through the two means, so that it can pass through the whole of the complete, solid, cosmic body, and grasp all existing things; and hence he extended its *harmonia* to that point, even though in one way, and in respect of its own nature, *harmonia* is capable of extending without limit.[28]

Therefore, Plato's use of music theory is very different from Philolaus's. As we have seen, Philolaus used musical *harmonia* as the prototypical example of the general principle of *harmonia*. It was the model for how limiters and unlimiteds in the cosmos were 'locked together' in such a way that a certain structure was imposed upon them. This structure carried with it number and ratio. Thus, Philolaus's epistemological concerns were also served by his use of musical *harmonia* as a model.

Plato, on the other hand, was concerned to give the cosmos a mathematical structure based on the three means or proportions. While these means are intimately connected with music theory, they also have meaning and application outside the realm of music, for example, in geometry. It thus appears that Plato used musical *harmonia*, in part, as a means for introducing these three means into his discussion of the cosmic soul.

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[28] The Treatise of Adrastus, first part (Theon Smyrn. 65.1-9, as translated by Barker, pp 220-221).

Furthermore, musical *harmonia* was used as a structure that was common to all levels of the cosmos. As we have seen in Chapter 5, Plato believed that the soul possesses a harmony(ies) that can be affected by other harmonies. By giving the cosmic soul this harmonic structure, it can beneficially affect human souls and furnish it with knowledge.

Section III

Chapter 7

The Stability of *Harmonia*

In Section II, states of worth were shown to be expressible by means of principles ontologically different from the opposites they were meant to unite. This was true for good states of body, soul and cosmos. A question remains. It was desired in all cases that these good states remain unchanged. For example, in the case of the body, we have seen that health was a positive state that both patients and doctors strove to preserve. Similarly, in the case of the soul, it was hoped that virtue, the positive state, was stable. But the preservation of these positive states wasn't at all an easy task. In what follows I shall summarize the models that we have found in various contexts, pointing out the opposites involved and the reconciling principles. Then I shall examine what the ancient Greeks believed to be the explanations and/or mechanisms that helped to preserve this stability.

In the previous examination of somatic *harmonia*, three different models of good or desired states emerged. The first, in which the positive state was health, was expressible by means of the isonomic proportion. The opposites that were blended according to this proportion were non-axiological, and were either the elements or humours themselves (in the case of the 'simple' conception of health), or smaller non-isonomic ratios of the elements (in the Aristotelian conception).

The second model used to describe good bodily states was expressed by non-isonomic proportion. The proper functioning, proper growth, and proper bodily organization of an organism were all described in this way. In this case the opposites were also non-axiological, however the non-isonomic proportions employed were often modelled after the proportions found in musical *harmonia*.

The third model of somatic well-being was found in explanations of perception. The sense organ, when healthy and ready to perceive, but not actually perceiving, was made up of non-axiological opposites blended according to isonomic proportion. Sensation takes place when this ratio in the sense organ is made to correspond to the sense object. This new ratio will be non-isonomic. Pleasurable sense objects are those which cause the ratio of the opposites in the sense organ to correspond to those ratios found in musical *harmonia* (2:1, 3:2, 4:3); displeasurable or painful sensations are caused by a ratio of the opposites in the sense organ being an incommensurable relation of excess and defect.

Through a discussion of psychological *harmonia* in chapter 5, it was shown that Plato made use of two different models of opposites and their reconciling principles. In both cases this reconciling principle was non-isonomic, and indeed the association with *harmonia* was explicit. The *Republic* conception of soul, however, seemed on the surface to be using only the political meaning of *harmonia* (covenant, unanimity), whereas in the *Timaeus*, the *harmonia* contained within the soul was clearly musical *harmonia*. It was shown, however, that on closer examination even the *Republic* conception of psychological *harmonia* relied implicitly on the ratios found in musical *harmonia*.

The opposites involved in Plato's psychological *harmonia* are different in the two dialogues. In the *Republic* it is clearly the parts of the soul which must be unified in order that the soul be virtuous, and these parts are clearly axiologically different from one another. In the *Timaeus* these parts of the soul, although again axiologically different, are quantified in terms of various speeds of movement. As speeds or vibrations, the parts become non-axiological insofar as they are used in explanations of sympathetic movement and psychological harmonization.[1]

In chapter 6, it was shown that good states of the cosmos were described in a similar way. Philolaus's cosmic *harmonia* clearly made use of non-isonomic proportion, as did Plato's cosmic *psuche*. How one views the opposites in Philolaus's model depends on the context. *Harmonia* in Fragment 6a is the unifying principle of both the opposites high/low and the ratios underlying the smaller concords which make up the octave. In either case, the opposites are non-axiological, but the conception of *harmonia* as a reconciling principle changes slightly, as it does in the case of somatic *isonomia* between the 'simple' conception and Aristotle's. Furthermore, when this musical *harmonia* is considered in the larger context of Philolaus's cosmology, it is a reconciliatory principle of axiologically different opposites. *Harmonia* is meant to unify the odd and even in the case of music which are specific instances of limiters and unlimiteds. Limiters and unlimiteds in this larger context are principles which are both ethically and epistemologically unequal.

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[1] It is perhaps timely to bring up again Aristotle's conception of virtue in this context. Debates over the conception of the mean and the opposites in his theory of virtue hinge to a large degree on whether the mean is an ontologically distinct principle from the opposites--whether, like the mean in medicine the mean in ethics is a blending of opposed impulses or motivational tendencies, or whether, like the early ethical mean, the mean is in between two opposed actions or feeling: the mean "is intermediate because it aims at what is intermediate" (see page 179 of George Terzis' article "Homeostasis and the Mean in Aristotle's Ethics" in *Aristotle, Virtue and the Mean*, *Apeiron* 25 (eds. Richard Bosley, Roger A. Shiner and Janet D. Sisson), Edmonton (1995): 175-189). In either case, the opposites involved are axiological equal. The extremes are both negative. George Terzis, however, has argued (in the above cited article) that both the extremes and the mean state can also be described at the physiological level at which the opposites are non-axiological and the reconciling principle is ontologically distinct and, perhaps, non-isonomic.

The kind of opposites employed by Plato in his descriptions of cosmic *psuche* is similarly dependent on his level of explanation. At one level, what is being brought together is Being, Same, and Other which are axiologically different elements. Yet at another level, what is being brought together are the quantities of these elements, and as quantities or portions, they are non-axiological.

Plato's cosmic body was also discussed in chapters 4 and 6. Although, most descriptions of cosmic body rely on a unifying principle of isonomic proportion, Plato in the *Timaeus* leaves open the possibility that the elements of the cosmos, although proportionate to one another, are unified by means of some non-isonomic ratio or one of proportional equality. In any case, the opposites are non-axiological.

What has emerged from the previous examination is that where there is a distinct principle which describes a positive state as a blending of opposites, there are two basic models which are employed. On the one hand, the positive state may be a blending of the opposites in a ratio of equality, e.g. general somatic health, the healthy non-perceiving sense organ, and the body of the universe. On the other hand, the positive state may be a blending of the opposites in non-isonomic ratio, e.g. proper bodily organization, growth and processes, pleasurable sensations, virtuous souls and cosmic blendings. In the latter case, the non-isonomic ratio usually correspond to those ratios found in musical *harmonia*.

These two basic models, although dissimilar with respect to the ratios employed, have a number of features in common. As has been shown, in both cases, the positive state is a blending of the opposites, a *krasis* of some sort. Thus, in both cases, the positive state is a unification of the elements; it is not the case that the opposites remain distinct in the mixture. Furthermore, both models employ opposites which, in the main, are non-axiological. The exceptions to this are those instances (for example psychological and cosmological *harmonia*) in which there are a number of levels of explanation, and although at one level the opposites are non-axiological, there is another level at which they are axiologically different.

Another similarity is that in both models the positive state, described either as an isonomic or non-isonomic ratio, is supposed to be relatively stable. This is so even for the positive states of body and soul, which, at least on the surface, are inherently unstable since they are susceptible to influence from the environment. It is to the notion of stability that I would now like to turn. I shall begin by looking at the stability of positive states characterized by isonomic ratio, and then consider those with harmonic ratios.

States characterized by an isonomic proportion of elements that have opposed characteristics or powers have within them a certain mechanism which explains their stability. The opposed powers of the elements, since they are equal to each other, counterbalance each other and stability results.

There are two different conceptions of this sort of stability in ancient thought. Stability based on equality is in some places expressed as a static union, and in others as a dynamic equilibrium. In a static union, opposites joined by the principle of equality are taken as a whole, and their opposed characteristics and/or forces cancel each other out; there is no change or alteration. In a dynamic equilibrium, the opposites undergo alteration and dominate each other successively, but the change is measured and the stability of the whole is maintained.

Static unions of opposites are found most often in descriptions of the cosmos. For example, Plato wrote the following in the *Phaedo*:

> This is what I believe, then, said Socrates. In the first place, if the earth is spherical and in the middle of the heavens, it needs neither air nor any other such force to keep it from falling; the uniformity of the heavens and the equilibrium of the earth itself are sufficient to support it. Any body in equilibrium, if it is set in the middle of a uniform medium, will have no tendency to sink or rise in any direction more than another, and having equal impulses will remain suspended. (*Phaedo* 108e-109a)[2]

The earth itself, or as Plato writes, any body that is in equilibrium, will be stable as long as it is placed and remains in a uniform medium. Thus, the body itself must be in a state of equilibrium, and the medium must be uniform.

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[2] This passage from the *Phaedo* has most often been taken as an articulation of the indifference principle (which has also been attributed to Anaximander; see *De Caelo* 295b11-16). The indifference principle is that the reason that something does not happen is because there is no reason for that thing to happen rather than anything else happening. This principle is thought to be present in this passage in the *Phaedo* insofar as the earth does not move or change position because there is no reason for it to move in one direction rather than another. While this interpretation of this passage is obviously different from my own, I believe that the 'equal impulses' within the earth could be seen as a balance of equal tendencies, i.e. one cancels the other out.

This stability will be enduring as long as these two conditions are met.

In the Pseudo-Aristotelian work *On the Universe*, the idea that stability is the result of equally balanced forces is explicit, however, the author does seem a bit confused about whether he is referring to *harmonia* (i.e. non-isonomic proportions) or *isonomia*.[3] The author wrote that the cosmos is made up of the most contrary principles, e.g. dry/moist, hot/cold, light/heavy, etc., and the most separate and different elements, i.e. air, earth, fire and water. These principles and elements are ordered by a *harmonia* which brings them together into a permanent unity. The author continues:

> The cause of this permanence is the agreement of the elements, and the reason of this agreement is their equal proportion and the fact that no one of them is more powerful than any other; for the heavy is equally balanced with the light and the hot with the cold. Thus nature teaches us in the greater principles of the world that equality somehow tends to preserve harmony, fairest thing of all.
> (*On the Universe* 397a1-5)

As in the passage from Plato's *Phaedo*, we find the idea that if the powers of the opposites are balanced, and thus no one of them is more powerful than another, then a stable equilibrium results.

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[3] It may, of course, have been the case that the author was not confused, and instead, that the distinction between isonomic and harmonic ratios was not important to him. But as we shall see in a few pages, the author of *On the Universe* explicitly considers the question of how axiologically different opposites (e.g. male and female, and socially different groups) can be united, since they are different in this way. Then by way of explanation, he states that they are equal to each other, and one is "no more powerful than the other", and gives as examples the hot and the cold, and the like.

Static stability is also found in Plato's discussion of the cosmic body in the *Timaeus*. The four elements, earth, air, water and fire were harmonized by proportion. Plato continued, "These conditions secured for it Amity, so that being united in identity with itself it became indissoluble by any agent other than Him who had it bound together" (*Timaeus* 32c). The Demiurge's intentions were that the cosmos be perfect and whole, that it be One and unique, and that it be unchangeable and unsusceptible to external influence. How the Demiurge achieved this sort of static unity was twofold. On the one hand, as we have seen, the elements were brought together and unified by means of proportion, and on the other hand, *nothing was left over;* the construction of the cosmos used up the whole amount of every element. This last condition was stipulated because of the following observation:

> He perceived that when heat and cold, and all things which have violent potencies, surround a composite body from without and collide with it they dissolve it unduly and make it waste away by bringing upon it ailments and age.
> (*Timaeus* 33a)

Therefore, the Demiurge compounded the cosmos out of all the elements that were in existence, thus securing for it everlasting static stability.

That a unified exhaustive whole is statically stable is also of course found in the thought of Parmenides and Melissus. There are, however, important differences between Being and the Cosmos. For one, Being was supposed to be homogeneous throughout--it is not stipulated that this homogeneity is the product of the proportionate blending of opposites.[4] Furthermore, Being is not supposed to be the entirety of the physical world--instead it is an ontologically distinct realm which is the object of knowledge. But, even though there are these differences, the conditions for stability are similar to those found in the *Timaeus*. For instance, Melissus wrote in Fragment 7 that Being cannot "perish or become larger or change its inner arrangement, nor...feel pain or grief". He also wrote that Being is like the state of health (statically conceived), and thus cannot feel pain, "for the Healthy--That which Is--would perish, and That which Is Not would come into being".[5] Being is a homogeneous sphere that is unified and imperturbable.

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[4] Although it is not stipulated that Being is composed of opposites blended to form a unity, in other authors opposites could be so blended: "Zeus when about to create changed into Eros, because by combining the Cosmos out of opposites he brought it into harmony and love, and sowed likeness in all, and unity extending through all things" (Pherecydes of Syros, DK B3, as translated by K. Freeman).

[5] Melissus of Samos, DK B7, as translated by Kathleen Freeman in *Ancilla to the Pre-Socratic Philosophers*, Cambridge, Massachusetts (1957): 48-49.

Thus, the cosmos as a whole was statically stable because of two factors: (1) the elements that make up the cosmos were equal to one another either in quantity or in power, and (2) the cosmos was made up of all the elements, so that it was not susceptible to influence from without; there was nothing outside to influence it.

The cosmos was also viewed as a dynamic equilibrium by some authors. Because the cosmos was made up of the sublunary elements which were susceptible to change and alteration--the cosmos was a whole composed of smaller parts that were in continuous flux--the stability of the cosmos could also be expressed as a dynamic equilibrium of the opposed forces and dominations. For example, Empedocles wrote that although the elements are equal in power and in age, they are still constantly undergoing alteration:

> ...Thus in so far as [the elements] have the power to grow into One out of Many, and again, when the One grows apart and Many are formed, in this sense they come into being and have no stable life; but in so far as they never cease their continuous exchange, in this sense they remain always unmoved (unaltered) as they follow the cyclic process.
> (DK B17, trans. Freeman, p. 53)[6]

Regarded on one level, the world is made up of elements that are constantly changing. Viewed, however, at the level of the whole, there is stability since the exchanges and changes balance each other. For example, the domination of fire at one time will be balanced by the domination of another element later, or may be balanced at the same time by the domination of another element at a different location.

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[6] See also DK B26 for the same idea.

A similar idea is found in *On the Universe*. The author wrote the following:

> Thus an unbroken permanence, which all things conspire to secure, counteracting one another--at one time dominating, at another being dominated--preserves the whole unimpaired through all eternity. (*On the Universe* 397b5-9)

As we have already seen, this author used the notion of static stability in his description of the cosmos. In this passage, we see that he also believed that stability is to be found in the successive domination of opposed forces. This latter kind of opposition, which we found too in the thought of Anaximander, Heraclitus and Diogenes of Apollonia,[7] was thought to form a sort of equilibrium as it is regulated by *harmonia*.

Thus, stability based on equality can be expressed as either a static union of equally powerful opposites, or as a dynamic equilibrium composed of the opposites ruling and being ruled according to a regulating principle based on equality. Although this regulating principle was often called '*harmonia*' (e.g. by Empedocles, Plato and the author of *On the Universe*), the stability was based on the equal powers or exchanges of the opposites. What then of *harmonia* conceived as a principle meant to unite unequal opposites or non-axiological opposites of differing powers or quantities? It is to this question that I now turn.

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[7] See Chapter 2.

While it is the case that ancient thinkers used *harmonia* as a stabilizing principle in both the cosmos and the sublunary realm, they did not explain in any clear way how the use of *harmonia* was supposed to achieve this result. It is clear that *harmonia* was that principle which was especially suited to bring together unequal opposites since the underlying ratios are non-isonomic and the resulting union can have a preponderance of the positive element. But there is no internal mechanism, as there is in a static union or a dynamic equilibrium based on equality, that explains how stability is generated or maintained.

We can see the tendency to use *harmonia* in this way in Philolaus's Fragment 6:

> And since there existed these principles, being neither alike nor of the same race, it would then have been impossible for them to be organised together, if *harmonia* had not come upon them, in whatever way it arose. The things that were alike and of the same race had no need of *harmonia* as well; but things that were unlike and not of the same race nor equal in rank, for such things it was necessary to have been locked together by *harmonia*, if they were to be held together in a cosmos.
>
> (DK B6, trans. Barker, p. 37)

Things that are like, of the same race and equal in rank have no need for *harmonia*. It is only those things that are unequal that require *harmonia*. Furthermore, *harmonia* 'locks together' these unequal things into a stable union. Thus stability is present, but there is no explanation given as to how this stability is achieved.[8] And if we look to his description of *harmonia* in music, no help is found. Again, *harmonia* there is just the fitting together of the various ratios that make up the octave.

The author of *On the Universe* takes us a little further, but not much. In answer to those who wonder why the Universe "has not long ago perished and been destroyed" since it is composed of contrary principles, he wrote the following:

> It is just as though one should wonder how a city continues to exist, being, as it is, composed of the most opposite classes--rich and poor, young and old, weak and strong, good and bad. They fail to notice that this has always been the most striking characteristic of civic concord, that it evolves unity out of plurality, and similarity out of dissimilarity, admitting every kind of nature and chance. It may perhaps be that nature has a liking for contraries and evolves harmony out of them and not out of similarities (just as she joins the male and female together and not members of the same sex), and has devised the original harmony by means of contraries and not similarities.

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[8] Although the authenticity of Fragment 10 has been doubted by Burkert and Huffman, it expresses a similar idea: "*Harmonia* comes to be in all respects out of opposites: for *harmonia* is a unification of things multiply mixed, and an agreement of things that disagree" (as translated by Andrew Barker, p. 38. Again we find the idea that *harmonia* is a unification and that it brings together things "multiply mixed" (i.e. non-isonomic). We also find the idea of agreement, which is perhaps meant to call to mind the political meaning of *harmonia*.

(*On the Universe* 396b1-11)

The author appears to be speaking of axiologically different opposites, and is relying on both the analogy of civic stability and marriage to explain cosmic harmonic stability. Furthermore, nature is a principle which uses *harmonia* to bring these opposed forces and things into a union.

When, however, this author goes on to explain the permanence of *harmonia*, he switches to a discussion of the permanence of isonomic proportion; the cause of stability is their equal proportion. Indeed, the passage in question has been quoted and discussed above (*On the Universe* 397a1-5, see pages 298-299).

Both Philolaus and the author of *On the Universe* seem, therefore, to be saying only *that harmonia* is stable, not *how* it is stable. The exception, perhaps, is in *On the Universe*, where the author appeals to political unions and marriage as models for this sort of stability. While it may have been true that marriage was more stable then than it is now, political systems were not. Thus, in these passages, it is difficult to see how *harmonia* was supposed to be stable, as there is no explanation furnished for it, nor is there a convincing model on which to base harmonic stability.

One more promising explanation of harmonic stability is found in the Greeks' discussions of number. Although harmonic and isonomic proportion are both composed of number, and thus what the authors write is applicable to both models of the reconciliation of opposites, an examination of what was written should help us to understand why the Greeks believed *harmonia* to be stable.

The numbers that make up isonomic and harmonic proportions were thought (in some cases by themselves, in other cases when in proportion) to bring stability to the mixture that they described. For example, Philolaus wrote that "Number is the ruling and self-created bond which maintains everlasting stability of the contents of the universe" (DK B23, trans. Freeman, p. 77). Furthermore, Archytas wrote that "...Right Reckoning, when discovered, checks civil strife and increases concord; for where it has been achieved, there can be no excess of gain, and equality reigns" (DK F3, trans. Freeman, p. 80). Philolaus thinks that number, in and of itself, is what provides the stability of the mixture. It is not a balancing of opposed forces or properties, but number itself which creates the stable bond. Archytas, on the other hand, although using number as an explanation of stability, falls back on the idea that with 'right reckoning' there is no excess or deficiency, and so 'equality reigns'; the opposites do balance each other. The context, however, from which this passage was taken is political. He continues by saying the following:

> It is [right reckoning] that brings us to terms over business contracts, and through it the poor receive from the men of means, and the rich give to the needy, both trusting that through it they will be treated fairly.
> (DK F3, trans. Freeman, p. 80)

Therefore, it is possible that by 'equality', Archytas meant something other than arithmetic equality. It is conceivable that what Archytas had in mind was the geometric proportion which when used in political contexts means that what is given to individuals is proportionate to their needs and social situation. If this is the case, then the ratio involved would be non-isonomic, but the same ratio would be used for all individuals, and so 'equality' would 'reign' in this sense.

Plato too believed that it is number that brings stability to the changeable physical world. He wrote in the *Philebus* that the family of limit, i.e. 'equal', 'double' and the other ratios, are those things "that [put] an end to the conflict of opposites with one another, making them well proportioned and harmonious by the introduction of number" (*Philebus* 25e). The examples that he provides are both isonomic and harmonic. He wrote that the imposition of the limited on the unlimited brings health, the "whole art of music in full perfection", fair weather, beauty, strength, and "a whole host of fair things found in our souls" (26a-b). Fair weather and health appear to be comprised of isonomic proportion, and indeed in his discussion of fair weather, Plato wrote that the imposition of limit on the unlimited creates measure and *balance*. The other examples are composed of non-isonomic proportion, and of these positive states, Plato wrote that they are 'limited', 'lawful' and 'ordered'. The progeny of the mixture of limited and unlimited is, Plato wrote, a unity (26d).[9]

Furthermore, we have already seen that Plato, in the *Timaeus*, thought that some sorts of proportions perfectly unite their terms. He wrote the following:

> For whenever the middle term of any three numbers, cubic or square, is such that as the first term is to it, so is it to the last term,--and again, conversely, as the last term is to the middle, so is the middle to the first,--then the middle term becomes in turn the first and the last, while the first and last become in turn middle terms, and the necessary consequence will be that all the terms are interchangeable, and being interchangeable they all form a unity. (*Timaeus* 32a)

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[9] My interpretation of *Philebus* 25e differs from how it is usually taken. The idea behind this passage as usually understood is that whereas a point on the unlimited continuum is both hot and cold, and therefore subject to logical conflict, the introduction of number makes it possible to define the point without such conflict, e.g. as twice as much hot as cold, etc. I do not believe that this sort of interpretation can account for all of the ideas present in this passage since it cannot account for why Plato calls these points "well-proportioned and harmonious".

Thus, according to this passage, it is the interchangeability of the terms found in certain kinds of proportion that begets stability.[10]

We have seen, then, that the stability of good states that are isonomic was explained by either a static balancing of opposed powers and/or characteristics, or a dynamic equilibrium of successively ruling and ruled opposites. Furthermore, the isonomic state had to be an exhaustive union of all the elements in existence. There could not be an external which would make it susceptible to influence from without, since any addition to or subtraction from the quantities and powers of the elements would destroy this union or equilibrium. Furthermore, the stability of good states that are harmonic was explained by the natural permanent bond that *harmonia* creates through the introduction of number, and as we saw in the *Timaeus*, the interchangeability of the opposites. In *On the Universe* we also saw an analogy made between *harmonia* and political stability and marriage.

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[10] Aristotle too thought that number is extremely important in descriptions of good states. He wrote the following in *Metaphysics* XIII.3: "Now since the good and the beautiful are different (for the former always implies conduct as its subject, while the beautiful is found also in motionless things), those who assert that the mathematical sciences say nothing of the beautiful or the good are in error. For these sciences say and prove a very great deal about them; for if they do not expressly mention them, but prove attributes which are their results or their formulae, it is not true to say that they tell us nothing about them. The chief forms of beauty are order and symmetry and definiteness, which the mathematical sciences demonstrate in a special degree. And since these (e.g. order and definiteness) are obviously causes of many things, evidently these sciences must treat

What, then, of the stability of health and virtue? As has been discussed, there were two basic conceptions of stability; stability was conceived as both a static union and as a dynamic equilibrium. It would be strange or counterproductive if the Greeks thought that ideal health was a static stability. After all, even the healthiest of people get sick occasionally, and are different from one another constitutionally when healthy.[11] The Greeks wanted health and virtue to be stable, but not stagnant. But even if it was the case that ideal health was seen as a dynamic equilibrium, problems remain. As we have seen, a crucial part of the explanation of the stability of a dynamic equilibrium is that there is nothing external to the whole which can disturb or destroy it. Yet the body *is* susceptible to external influence, indeed profoundly so.

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this sort of cause also (i.e. the beautiful) as in some sense a cause" (1078a31-b5).

[11] It is interesting to note in this context that ideal health was later conceived as statically stable and thus in principle unattainable. In medieval thought, for instance, ideal health was supposed to have been taken from man in his expulsion from Paradise (see page 79 of *Saturn and Melancholy: Studies in the History of Natural Philosophy, Religion and Art*, by Raymond Klibansky, Erwin Panofsky and Fritz Saxl, London (1964)). For a polemic against the idea that man is a static unity, see *Nature of Man*, chapters i and ii. In chapter ii the author writes that if man were a static unity, he would never feel pain (ii.10-15).

The problem, in part, is that like the sublunary elements that were described by Empedocles, our bodies are continually undergoing change and alteration. Thus, it appears that health can't really be stable at all, even though, perhaps because we are conscious and changes mean disease and pain, we strive to preserve our health--safeguard ourselves against change.[12] On the surface at least, there appears to be no internal homeostatic mechanism designed to preserve or maintain the isonomic proportion of health. As Edelstein wrote:

> The balance of health could necessarily never be permanently sustained, but attained only for the moment. For the relationship between the various parts is continually subject to change because of the constant intake of fresh nourishment, because of constantly new activities, and because of automatic seasonal increase and decrease in the bodily fluids or in their circulation under the influence of the imbalance as it arises.[13]

Virtue, too, appears to be inherently unstable since it too is affected by the environment. As we saw in Chapter 5 the *harmonia* in the soul is affected by both good and bad musical *harmonia*, *qua* imitations of character, as well as cosmic *harmonia*.

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[12] That the Greeks were preoccupied with the preservation of health hardly needs to be mentioned. For my discussion of this, see Chapter 6.

[13] Edelstein p. 70. He makes the same point again a bit later: "...there is neither in theory nor in practice a healthy man. For health has no being but is a continuous becoming. The result is a nervosity in daily life and the use of medicines even when one is healthy...to be healthy means, simply, not to be sick" (Edelstein p. 84).

Yet, in spite of their appearance of fragility, both health and virtue were thought to be relatively stable. This is manifest in the Greeks' use of 'constitutions' and 'character states' in their discussions of health and virtue. Individuals had constitutions which were characterized by the preponderance of one state of bodily proportion over another. For example, in the Hippocratic *Regimen*, the author treated the characteristic qualities of a number of constitutions and recommended a variety of foods and exercises for each. This was done in order to help counteract the natural preponderance of one or more of the elements and/or humours. Similarly, individuals have character states that predispose them to act virtuously or viciously in various situations. In the *Nicomachean Ethics* Aristotle wrote that these states are relatively stable.[14]

The stability of these states, as we have seen, cannot be explained by the counterbalancing of opposites since this dynamic equilibrium is influenced by the environment. Therefore the Greeks had to look elsewhere for an explanation of the stability of constitutions and character states. There are three Greek ideas that I would like to consider: the first is that good states are more stable than bad; the second is that the stability of both the body and soul can be safeguarded by imitating the divine *harmonia*, proportion, or number, and the third is how the notion of habit was used in both medicine and ethics to describe a stable propensity.

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[14] *NE* III 5, 1114a15-23. See below for a discussion of this passage and others having to do with the stability of character states.

(i) Good states are more stable than bad

That good states are inherently more stable than bad states is a belief that both Plato and Aristotle shared. And it is a belief that has grounding in empirical observation. For example, artificial objects that are well made are more enduring than those that are not, and, on the whole, healthy people live longer than people troubled with illness. If it is the case that these good states are characterized by a fitting together of two or more things according to harmonic or isonomic proportion, then we find in this idea empirical justification for the claim that both isonomic and harmonic states in the body and soul are relatively stable.

In the context of a discussion as to whether the gods and goddesses can change their forms, Plato wrote the following:

> Now the best things are least liable to change or alteration. For example, the body by food or drink or labour, or any plant by sunshine and wind and the like; does not the healthiest and strongest change least? --Of

> course.-- The strongest and most knowledgeable soul would be least disturbed and changed by any outside experience. --Yes.-- So with all artifacts, furniture, and houses and clothes, those which are well made and good are least changed by time or anything else that happens to them. --That is so.-- Anything then which is in good condition, either by nature or as the product of a craft, or both, is least changed by anything else. --That is likely.
> (*Republic* 380e-381b)

The good states that Plato mentions are health and strength, knowledge, and well made artifacts. We have already seen that Plato characterizes health as being comprised of the isonomic proportion of the elements, and furthermore, artifacts are the bringing together of parts into a harmonious whole. Thus it is conceivable that Plato thought that it was because of the proper organization of parts that the object was more enduring.[15]

Aristotle too, in the *Nicomachean Ethics* wrote that happiness and virtue are more stable than any other state. Happiness, Aristotle wrote, is "something permanent and by no means easily changed" (*NE* I 10, 1100b2-3). Happiness does not have to do with the many fortunes and misfortunes that a man may experience, but instead proceeds from the performance of virtuous activities (*NE* I 10, 1100b9). Aristotle continues:

> ...no function of man has so much permanence as virtuous activities (these are thought to be more durable even than knowledge of the sciences), and of these themselves the most valuable and more durable because those who are happy spend

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[15] See also *Apology* 31d for the idea that the good man is unaffected by his environment.

> their life most readily and most continuously in these; for this seems to be the reason why we do not forget them. The attribute in question [i.e. durability], then, will belong to the happy man, and he will be happy throughout his life; for always, or by preference to everything else, he will be engaged in virtuous action and contemplation, and he will bear the chances of life most nobly and altogether decorously, if he is 'truly good' and 'foresquare beyond reproach'. (*Nicomachean Ethics* I 10, 1100b12-21)

While it is true that many great misfortunes may take away a virtuous man's happiness, it will not take away his virtue, for he is not "many-coloured" or "changeable" (*NE* I 10, 1101a9). Furthermore, just the performance of virtuous actions is not enough; the good does not reside in the action itself. Instead, the good state resides in the person's character. The character must be virtuous, which means that it is firm and unchangeable (*NE* II 4, 1105a28-35).

Furthermore, Aristotle seems to identify this 'firm and unchangeable' character with a state of rest. He wrote in Book VII that god enjoys simple pleasures that are activities of immobility, for "pleasure is found more in rest than in movement" (*NE* VII 14, 1154b27). Although the common view is that pleasure is found in change, this is because of vice, i.e. the vicious person's character is changeable, and this nature needs change (1154b28-31). A virtuous person, on the other hand, is more like god in that (s)he enjoys the more simple and good pleasures--those that are not characterized by a movement. So in this sense too, the virtuous person's character is stable, which is interesting since it seems that what Aristotle is describing is a stability based on *stasis*.

Therefore, according to Aristotle, the virtuous state is stable and is less likely to change or be affected by external circumstances than vicious states. Even the pleasure that is appropriate to virtue is characterized by a state of immobility and rest. Furthermore, like the fact that well made artifacts are more enduring, that virtuous people are more likely to remain virtuous and happy has both intuitive appeal and is confirmed by the observation of virtuous people. Truly good people don't often turn to vice, and when we do observe this circumstance, we tend to think that the person was never truly virtuous.

Both Plato and Aristotle think that at least some good states are more stable than bad states. As we have seen, this belief has grounding in empirical observation: well made objects are more enduring, healthy people tend to live longer, and virtuous people tend to be virtuous for their whole life. In the case of artifacts, it is clear that when they are enduring, their parts have been put together properly and skilfully; this is what it means to be 'well made'. Thus, the good state is characterized by the proper cohesion of the parts when organized accurately. It is conceivable that this model was used to account for the stability of somatic and psychic stability as well. Both health and virtue were viewed as a certain structure that could be well or badly organized. This is clear in the thought of Plato, and although Aristotle's account of virtue is quite a bit different, it was the case that the virtuous person's appetites had to harmonize with their rational principle (*Nicomachean Ethics* II 11, 1119b14-20).

(ii) Imitation of divine number and proportion

The second Greek idea that I would like to examine is that the stability of the good states in both the soul and body can be preserved if we actively imitate the movements, proportions or number found in the divine. We have already seen that the cosmos itself is stable because there is nothing external which can affect its harmonic or isonomic proportion. A number of Greek thinkers believed that by imitating the divine proportions or number in both the body and soul, these numbers or proportions themselves would help to preserve the good states.

This idea is found in the fragments of Epicharmus of Syracuse. He wrote that "Life for mankind has great need of calculation and number. We live by calculation and number; these preserve mortals" (DK B56, trans. Freeman, p. 39). What the author meant is brought out in another fragment:

> The Law (Logos) steers mankind aright and ever preserves them. Man has calculation, but there is also the divine Logos. But the human Logos is sprung from the divine Logos, and it brings to each man his means of life, and his maintenance. The divine Logos accompanies all the arts, itself teaching men what they must do for their advantage; for no man has discovered any art, but it is always God.
> (DK B57, trans. Freeman, p. 39)

People need number and calculation for their preservation. Number and calculation are required for the execution of the arts which preserve us, and these were given to men by god. Although there is no explicit mention of the body or soul, or health or virtue, it is conceivable that the art of medicine was meant to be included in those arts that use number, and that the *logos*, as well as meaning 'law' is also supposed to refer to proportion. So, by using the human *logos* in the arts, which is sprung from the divine (stable) *logos*, we maintain and preserve ourselves.

Plato, in the *Timaeus*, is explicit that we should imitate the divine movements so that we may bring a dynamic stability to both our souls and our bodies. In the case of soul, the positive state is characterized by an unvarying movement: "...and that, through learning and sharing in calculations which are correct by their nature, by imitation of the absolutely unvarying revolutions of the God we might stabilize the variable revolutions within ourselves" (*Timaeus* 47c). Therefore, what we must do is learn and share in those calculations that are 'correct by their nature', those that are found in the cosmic soul. By so doing we imitate them in our souls, and the movement that exists there is stabilized, and the new divine movement endures.

Plato believes that a similar strategy will help us to preserve our health. He wrote the following:

> The various parts, likewise, must be treated in the same manner, in imitation of the Universe. For as the body is inflamed or chilled within by the particles that enter it, and again is dried or moistened by those without, and suffers the affections consequently on both these motions, whenever a men delivers his body, in a state of rest, to these motions, it is overpowered and utterly perishes; whereas if a man imitates that which we have called the nurturer and nurse of the Universe, and never, if possible, allows the body to be at rest but keeps it moving, and by continually producing internal vibrations defends it in nature's way against the inward and outward motions, and by means of moderate vibrations arranges the affections and particles which stray about in the body in their due reciprocal order, according to their affinities,--as described in the previous account which we have given of the Universe--then he will not suffer foe set beside foe to breed war in the body and disease, but he will cause friend to be set beside friend so as to produce sound health.
> (*Timaeus* 88d-e)

The parts of the body, if in a state of rest, are susceptible to the influence of movements that come from the environment. If, however, one sets up in these parts movements which are the same as the movements found in the cosmic body, then one is better able to ward off the influence of the movements from the environment. Further, these internal movements not only ward off environmental influence, but they also 'arrange the affections and particles' in the body in their 'due reciprocal order'. Thus, by setting up these motions within ourselves, we not only defend ourselves against the environment, but these motions bring our bodily elements into proportion, i.e. health.

Therefore, we can preserve and achieve these good states, i.e. health and virtue, by imitating the corresponding states found in the divine cosmos. These latter states are stable, and by imitating their characteristics, we too can achieve a dynamic stability in the sublunary realm.

(iii) Habit becomes nature

There is the belief in many ancient writings that if a condition ('normal' or 'abnormal') is present in a body for a long time, then it will become ingrained. Similarly, if an action (good or bad) is repeated over and over again, then a propensity will arise to perform the particular action again. What this usually meant was that the elements of a body and/or soul were brought to that state which corresponded to this 'new' condition, and this 'new' state was relatively stable. For example, in *The Sacred Disease*, the author wrote that epilepsy, no less than any other disease, is curable, "unless by long lapse of time it be so ingrained as to be more powerful than the remedies that are applied" (v.3-5). Furthermore, in the prescription of appropriate regimens, the physician was supposed to take into account the habits of the patient, as change in this regard could lead to illness in its own right, even if the original habits of the patient were not healthy.[16] Indeed, Aristotle in the *Problems* wondered why it is that when an intemperate man adopts a temperate mode of life, he becomes ill. He wrote, "[is] it because in every one habit is a matter of importance, since it soon becomes nature?" (*Problems*, XXVIII.1, 949a28-29).

The idea that habits become ingrained plays a very important role in character state formation in the ethical theories of both Plato and Aristotle. For example, Plato wrote the following in the *Republic*: "You know that the beginning of any process is most important, especially for anything young and tender. For it is at that time that it takes shape, and any mould one may want can be impressed upon it" (*Republic* 377b). Therefore, what games children play--what characters they imitate--is extremely important:

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[16] See for example *Regimen in Acute Diseases*, chapters xi, xxiv, xxviii-xxxiii, xxxv-xxxvii and lxvi.

> If [the guardians] do or imitate anything else it must be, from childhood on, what is suitable to them, namely brave, self-controlled, pious, and free men and all their actions.... Have you noticed that imitations, if they last from youth for some time, become part of one's nature and settle into habits of gesture, voice and thought?
> (*Republic* 395c-d)

Habits become nature. Therefore, it is extremely important to monitor and guide the habits that children form.

Aristotle agreed with Plato on this point. Because none of the moral virtues arise in us by nature,[17] but instead come about as a result of habit,[18] the character state that we end up with will be a result of the habits we have formed; a virtuous character will be the result of practising virtuous actions and a vicious character will be the result of practising vicious actions, since "states of character arise out of like activities".[19] Therefore, "it makes no small difference, then, whether we form habits of one kind or another from our very youth; it makes a very great difference, or rather all the difference" (*NE* II 1, 1103b23-25).

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[17] *NE* II 1, 1103a20.

[18] *NE* II 1, 1103a17-18, and 1103a32-b2.

[19] *NE* II 1, 1103b20.

What is more, it seems that once a character state is settled in a person's soul, it is extremely difficult, if not impossible, to change it. There appears to be a window of opportunity in the beginning of one's life, which disappears as the habits become ingrained, and this is true in both the case of health and virtue. Aristotle wrote the following:

> We may suppose a case in which [a man who is ill] is ill voluntarily, through living incontinently and disobeying his doctors. In that case it was *then* open to him not to be ill, but not now, when he has thrown away his chance, just as when you have let a stone go it is too late to recover it; but yet it was in your power to throw it, since the moving principle was in you. So, too, to the unjust and to the self-indulgent man it was open at the beginning not to become men of this kind, and so they are unjust and self-indulgent voluntarily; but now that they have become so it is not possible for them not to be so.
>
> (*NE* III 5, 1114a15-23)

It does seem, however, that Aristotle thinks that one can change one's character later in life, albeit with extreme difficulty. In Book II.9 he wrote that "...we shall get into the intermediate state by drawing well away from error, as people do in straightening sticks that are bent" (*NE* 1109b6-7), which suggests that vicious people, like bent sticks, can be brought back into the straight and narrow. Furthermore, incontinent people are more 'curable' than intemperate, and of incontinent people, "those who are incontinent through habituation are more curable than those in whom incontinence is innate" (*NE* VII 10, 1152a28-30). This is because habits are easier to change than nature, but given that habit becomes nature, this change too will be extremely difficult.[20]

Both Plato and Aristotle therefore believe that character states are formed by habits and the environment. Except in those cases in which individuals are mentally 'deformed' or incapable of developing habits, the character state that one acquires is determined by what kind of actions are imitated or performed. Once these habits become ingrained, they are just as strong as nature; indeed habit becomes nature. Further, this 'nature' is not just relatively stable, but virtually unchangeable.

According to some authors, the physical environment was also thought to play an extremely important role in both constitution and character formation. As the author of *Airs, Waters, Places* wrote, individuals take on the characteristics of their locality: "...in general you will find assimilated to the nature of the land both the physique and the characteristics of the inhabitants" (xxiv.45). For example, people from north-facing towns will be sinewy and spare, in part because of the dryness of their bodies along with the coldness of the water, and this will lead to various endemic diseases (iv.5,12,18). Furthermore, where there are many and sharp contrasts in the seasons and temperatures, the people will be wild, unsociable and spirited (xxiii.20), whereas "growth and freedom from wildness are most fostered when nothing is forcibly predominant, but equality in every respect prevails" (xii.17-18). Thus, the condition of the environment determines the constitution and character of the individual.[21]

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[20] See *NE* VII 10, 1152a30-35.

Similar ideas are found in the Aristotelian *Problems*. The author believed that by growing up in an environment which was characterized by a predominance of heat or cold or dry or moist, one's constitution would not be temperate; there would be an excess of one or more of the elements, and this would cause disturbance and distortion in both the body and the soul (*Problems* XIV.1). The general view among many authors was that a moderate climate, one that has an excess of neither hot nor cold, engendered both health and virtue.[22] It was, however, sometimes thought that a small excess or deficiency of one of the qualities would produce specific virtues. For example, cold regions were thought to produce courage, warm regions wisdom.[23]

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[21] See *Politics* VII.11 where Aristotle echoes many of the ideas presented in *Airs, Waters, Places*.

[22] Incidentally, according to a number of authors, Greece was thought to have this perfect, moderate, geographical location. See for

Institutions too were thought to play a role in the development of constitutions and characters. Describing a situation that is quite similar to what we would call 'learned helplessness', the author of *Airs, Waters, Places* wrote that "where men are not their own masters and independent, but are ruled by despots, they are not keen on military efficiency but on not appearing warlike" (xvi.20), for "all their worthy, brave deeds merely serve to aggrandize and raise up their lords" (xvi.27). Men who are independent, on the other hand, "are the most warlike of all men. For it is for their own sakes that they run their

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example Aristotle's *Politics* VII 7, Herodutus' *Histories* IX.122 and Plato's (?) *Epinomis* 987d where the author wrote: "We Greeks enjoy a geographical situation which is exceptionally favourable to the attainment of excellence. Its merit should be sought in the fact that it lies midway between winter and summer." Furthermore, in the *Timaeus*, the goddess was thought to have chosen the locality of Athens for its positive qualities: "Again, with regard to wisdom, you perceive, no doubt, the law here,--how much attention it has devoted from the very beginning to the Cosmic Order, by discovering all the effects which the divine causes produce upon human life, down to divination and the art of medicine which aims at health, and by its mastery also of all the other subsidiary studies. So when, at that time, the Goddess has furnished you, before all others, with all this orderly and regular system, she established your State, choosing the spot wherein you were born since she perceived therein a climate duly blended, and how that it would bring forth men of supreme wisdom. So it was that the Goddess, being herself both a lover of war and a lover of wisdom, chose the spot which was likely to bring forth men most like unto herself, and this she first established" (*Timaeus* 24c-d).

[23] See for example Aristotle's *Problems* XIV, chapters 8, 15 and 16.

risks, and in their own persons do they receive the prizes of their valour as likewise the penalty of their cowardice" (xvi.37-39).[24] Thus, the environment (both natural and artificial) in which one grew up determined to a large degree one's constitution. The inequality or equality of the elements in the environment affected the elements or humours within the body, and this internal mixture formed one's constitution.

Given the role assigned to the environment in constitution and character formation, one might think that humans, or at least fetuses,[25] are entirely plastic, formed solely by the environment with no innate characteristics at all. The author of *Airs, Waters, Place* does, however, assign some role to nature in constitution formation, although it is a relatively small role. The author thinks that natural and acquired characteristics are inherited. He writes of the so-called 'Longheads' the following:

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[24] See also chapter 23, lines 28-41.

[25] The author of *Airs, Waters, Places* thought that where there are few changes in the environment, the inhabitants will be more homogeneous. He wrote, "The men [in such an environment] will be well nourished, of very fine physique and very tall, differing from one another but little either in physique or stature" (xii.35). Whereas, in environments that are more changeable, the inhabitants are less homogeneous. The reason for this is that the environment affects the "coagulation of the seed" or the formation of the fetus; it is "not the same for the same seed in summer as in winter nor in rain as in drought", and the same thing is true for character (xxiii.6-19). Thus, by maintaining that the environment affects and determines the nature of the fetus, it appears that both the physical and psychological characteristics of an individual are determined solely by the environment.

> There is no other race at all with heads like theirs. Originally custom was chiefly responsible for the length of the head, but now custom is reinforced by nature. ... As soon as a child is born they remodel its head with their hands, while it is still soft and the body tender, and force it to increase in length by applying bandages and suitable appliances.... Custom originally so acted that through force such a nature came into being; but as time went on the process became natural, so that custom no longer exercised compulsion. For the seed comes from all parts of the body, healthy seed from healthy parts, diseased seed from diseased parts. If, therefore, bald parents have for the most part bald children, grey-eyed parents grey-eyed children, squinting parents squinting children, and so on with other physical peculiarities, what prevents a long-headed parent having a long-headed child? At the present time long-headedness is less common than it was, for owing to intercourse with other men the custom is less prevalent.
> (*Airs, Waters, Places* xiv.5-28)

From this passage, it would seem that individuals indeed have natural propensities to certain characteristics, whether these characteristics arose originally from nature or from custom. If the generative seed comes from all parts of the bodies of the parents, then the resultant child will have a mixture of his or her parents' constitutions. What this means then, given what the author has said elsewhere, is that the offspring of homogeneous parents--parents who live in temperate climates--will be homogeneous also.[26] Offspring of parents with differing constitutions and characters will be diverse, not only for the reason that the parents' seeds won't be similar, but also because these sorts of people will most likely come from localities that have the most frequent and sharply contrasted changes in the seasons, which itself will have a direct influence on the formation of the fetus in the womb.

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[26] Aristotle writes too that homogeneity arises among people who have had a similar upbringing. The most homogeneity exists between those who are born of the same parents, have been brought up together and have had the same education. These people will be most alike in character (*NE* VIII 12, 1162a13-14).

I have here been assuming that the children would grow up in the same locality as their parents, and thus their inherited characteristic would, on the whole, be augmented by the environment. What happens, however, when an individual moves from one locality to another? Are constitutions like Aristotle's character states which are virtually unchangeable once they have been formed? We have seen that one's constitution is almost entirely formed by the environment in which one grew up. What influence is the environment supposed to have on these constitutions once 'habit has become nature'?

The author of *Airs, Waters, Places* seems to believe that the influence of the environment is stronger than the power of both the constitution *and* character. For example, he writes that "even if a naturally brave and spirited man is born [in a state ruled by a despot] his temper is changed by their institutions" (xvi.30-32). Moreover, according to the same author, anyone who immigrates to certain temperate areas of Asia Minor will become mild-natured because of the climate:

> This region, both in character and in the mildness of its seasons, might fairly be said to bear a close resemblance to spring. Courage, endurance, industry and high spirit could not arise in such conditions either among the natives or among immigrants, but pleasure must be supreme.
> (*Airs, Waters, Places* xii.38-44)

Therefore, it seems that according to the author of *Airs, Waters, Places* nature (i.e. either a congenital disposition or an acquired constitution) plays a very small role in the continued existence of a constitution or character. Indeed, far from the environment augmenting nature, it seems instead that nature (i.e. congenital dispositions or acquired constitution), if it has any role at all, merely augments the influence of the environment.[27]

From the above examination of the role of habit and the environment in bodily constitutions, constitutions do not appear to be dynamically stable. It seems as though one's constitution is entirely determined by the environment in which one finds oneself. Thus, it also seems that one cannot preserve health, since the environment is always changing. There is, however, one kind of situation (constitution and locality) which engenders and preserves health. This is the constitution and character of people who live in temperate climates. As we have seen, the people who live in such an environment have homogeneous constitutions that are natural and (perhaps statically) stable, because in such a locality "equality [*isomoirie*] in every respect prevails" (*Airs, Waters, Places* xii.17). Furthermore, because the environment is temperate, there are but few things that will disturb the equilibrium of the body. Thus, as long as these people stay in the same environment, they will remain for the most part healthy.[28]

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[27] In many ways Aristotle's views are similar to that of the author of *Airs, Waters, Places* in this respect as well. While it is clear that according to Aristotle, a character state, once formed, is stable, he assigns the same small role to congenital disposition in character formation as does the author of *Airs, Waters, Places*. For example, Aristotle does believe that one may have a natural propensity to feel certain emotions more than others, as is shown by the fact that the mean is always closer to one extreme (*NE* IV 1, 1121b11-15), and he believes that some children may have a natural disposition to be morally virtuous, but that virtue in the strict sense also requires reason (see *NE* VI 11, 1143b6-13 and VII 10, 1151a16-26). Moreover, as we saw above, he believed that one could be incontinent due to nature, not just habit. Therefore, although the habits that we develop early in life determine our moral characters, nature is involved to a limited degree and can augment the effects of habit.

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[28] It is interesting to note that the author of *Airs, Waters, Places* seems to change his mind about the mental characteristics of people who live in such temperate localities. In chapter 5 he describes such people as having better complexions, temper and intelligence than those exposed to sharp changes in the climate, but in chapter 12, he wrote that industry could not arise in such conditions, and he goes even further in chapter 24 where he writes that people who live in rich, soft, well-watered lands are fleshy, ill-articulated, lazy, cowardly, slack, sleepy, thick-witted in the arts, and neither subtle nor sharp (xxiv.46ff.). A possible explanation for this change in mind could be the author's 'Hellenocentrism'; for the most part, these temperate climates are found in Asia Minor, whereas the changeable climates are found in Greece.

Through the previous examination of stability in both the cosmos as a whole and in the sublunary realm, one general rule concerning stability has emerged. This is: 'The better a thing is, the more stable it is'. We saw this rule explicitly remarked upon by Plato in the *Republic*, and Aristotle applied it in his theory of virtue. It is also, however, manifest in explanations of the stability of the cosmos. The cosmos, as divine, is more stable than the sublunary world, because it manifests proportion (either isonomic or harmonic) most perfectly. Granted, the cosmos is able to manifest these proportions most perfectly and enduringly because there is nothing external to it which can influence it. But regardless of whether it is more perfect because there is nothing external, or whether because it is most perfect it will have nothing external to it, the fact of the matter is that the cosmos is most perfect: it exhibits proportions to the most perfect degree; it is a unified whole; it is stable.

The fact that the cosmos exhibits these qualities most perfectly is, no doubt, the reason why humans need to imitate it in order to achieve a degree of stability. The best is most stable, and this best state is characterized by the proportionate (isonomic or harmonic) blending of various qualities and forces. We as humans are also composed of the same qualities and forces, without, however, the same degree of stability since we are subject to influence from without. The stability of the cosmos is explainable and apparent; the opposites which make up the cosmos come together in the best ratios which themselves are inherently stable (and in many explanations the proportion used is isonomic so that there is a mechanism for stability 'built in' to the ratio), and further, there is nothing external to the cosmos to disrupt this stability. We humans--the changeable creatures who inhabit the sublunary realm that we are--have no such luck. Not only are we susceptible to influence from the environment, but there is no guarantee that our bodies or souls contain the best proportionate blending of the elements in the first place.

By imitating the divine cosmic state, however, we can approximate the stability found in the cosmos. That we can achieve stability in this way is explained by different authors in three ways: (1) when our bodily or psychic proportions are in the best states possible they are more enduring than they would be otherwise, (2) we can preserve our health and virtue by setting up movements which are supposed to ward off external movements (as was written in the *Timaeus*), and (3) by using number and calculation by way of the arts and otherwise, we help maintain and preserve ourselves (as was found in Epicharmus).

Thus, humans can achieve some sort of stability of body and soul by trying to reproduce in both the body and soul the proportions that are found in the cosmos as a whole. Indeed, the fact that we can imitate the divine proportions, if only to a limited degree, points to the ironic fact that while it is our rationality (by way of choice) that helps us achieve stability, it is in virtue of the fact that we are rational that we find our own inherent instability unsatisfactory--indeed terrifying. On the one hand, because we are rational we can choose to engage in those actions and activities which will preserve our health and virtue, i.e. we can actively attempt to imitate the divine proportions, and as we saw in section (iii) above, make habit into a stable nature. But on the other hand, it is because we are rational that we strive to be virtuous at all, and it is because we are rational, conscious beings that states of disease are so unpleasant. We are different from both other inanimate sublunary elements as well as non-rational animals, both of which are also unstable, in virtue of our rationality, and it is because of our rationality that we can be virtuous, and take pains to be healthy.

We have also seen that it is easier to preserve virtue once achieved than it is to preserve health. This seems to be because there is more choice involved in being virtuous than there is in being healthy, and perhaps too because of the association of pain and pleasure with particular choices. Indeed, the author of the *Problems* wrote,

> Why is it that a man who associates with one who is healthy does not himself become any healthier, nor does association with the strong or beautiful improve a man's condition, whereas association with the just and temperate and good does have this effect? Is it because some qualities can, and others cannot, be imitated by the soul, goodness being a quality of the soul and health of the body? A man can, therefore, accustom himself to feel pleasure and pain under the proper circumstances; but his association with the healthy does not produce this result, for health does not consist in taking pleasure or not in certain things, since none of these things can produce health.
>
> (*Problems* XXIX 10, 951a4-10)[29]

Therefore, virtue is more stable than is health. There is, however, one model of a de facto stability in health in the ancient literature.

We saw in *Airs, Waters, Places* that the characters and, perhaps especially, the constitutions, of individuals are entirely determined by the qualities of their locality, and thus there is no inherent stability in constitutions and character; there is no homeostatic mechanism in the body designed to maintain a dynamic or static balance of the elements/humours. We did see, however, that the author believed that health can be preserved if an individual lives in a temperate climate, where no one quality is predominant. Like Plato's description of the earth in the *Phaedo*, a body is stable if it is composed of an equilibrium when placed in a homogeneous or stable environment. Thus, although constitutions and characters are not inherently stable, a de facto stability can be achieved if the condition of the body and environment is similar to that of the cosmos.

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[29] See also *Problems* VII.4.

Proportion or number is what gave the cosmos, at all its levels, some degree of stability. Underlying all good stable states are proportion, but all states characterized as a proportion, although still all good, are not stable. This is because these unstable good states can be influenced by the environment.

Harmonia, both as a group of non-isonomic musical proportions and a reconciling principle, was used by the Greeks to describe good states, both stable and otherwise. *Harmonia*, describing and producing good states, helped to provide a limited stability to the sublunary world. Moreover, because *harmonia* brought number to the opposites that it united, it connected the stability which was manifest in number with those good states that it described in the sublunary realm.

Number and proportion could not, however, guarantee stability without the added condition that the object be safe from external influence; number and proportion could only help to preserve stability in the sublunary realm. As we have seen, the *harmonia* of a thing cannot direct the thing's parts; the presence of proper proportion is only evidence that the object is in its best condition. It was, in part, this shortcoming in the idea of proportion that lead Aristotle to reject the idea that soul is a *harmonia*. It may also have been this shortcoming that led Aristotle to say that the formal cause of humans was the soul, and that it *did* have a directive capacity.

Even so, *harmonia* was to the Greeks "the fount and root of ever-flowing nature", a "gift from the blessed choir of the Muses", what gave to humans "the boon of the play of consonance and rhythm". Musical *harmonia* provided a model for the Greeks; a model of how number could underlie physical phenomena, and thus a model of stability and beauty for a world that was manifestly chaotic and frightening.

Bibliography

Barker, Andrew *Greek Musical Writings, Volume II: Harmonic and Acoustic Theory*, Cambridge (1989).

Barnes, Jonathan *The Presocratic Philosophers*, Second Edition, London (1982).

Barnes, Jonathan (ed.) *The Complete Works of Aristotle*, Volumes I and II, Princeton (1984).

Bostock, David *Plato's Phaedo*, Oxford (1986).

Burnet, John *Early Greek Philosophy*, first edition 1892; fourth edition 1930 (with revisions) by the MacMillan Company.

Burkert, Walter *Lore and Science in Ancient Pythagoreanism*, (translated by L. Minar Jr.) Cambridge, Massachusetts (1972); originally published as *Weisheit und Wissenschaft: Studien zu Pythagoras, Philolaus und Platon*, Nurnberg (1962).

Bury, R.G. (trans.) *Plato IX: Timaeus, Critias, Cleitophon, Menexenus and Epistles*, Loeb Classical Library, Cambridge, Massachusetts (1929).

Cassell's Latin Dictionary (revised by J.R.V. Marchant and Joseph F. Charles), London (1928).

Cook, Albert *Homer/ The Odyssey*, New York (1967).

Cornford, Francis M. "Was the Ionian Philosophy Scientific?" in *Greek and Roman Philosophy: A 52 Volume Reprint Set*, Vol 10: *The Selected Papers of F.M. Cornford* (ed. A. Bowen), New York (1987).

Cornford, Francis *From Religion to Philosophy*, London (1912); reprinted by Harvester Press Ltd. in 1980.

Cornford, Francis *Plato's Cosmology*, London (1937).

Diels, H. *Die Fragmente der Vorsokratiker*, 6th ed. revised with additions and index by W. Kranz, Berlin (1952; often reprinted).

Edelstein, Ludwig *Ancient Medicine* (eds. Owsei Temkin and C. Lilian Temkin) Baltimore (1967).

Flint, Valerie I.J. *The Rise of Magic in Early Medieval Europe*, Princeton (1991).

Foucault, Michel *The History of Sexuality, Vol. 2: The Use of Pleasure*, New York (1985).

Frazer, R.M. *The Poems of Hesiod*, Oklahoma (1983).

Frede, Michael *Essays in Ancient Philosophy*, Minneapolis (1987).

Freeman, Kathleen *Ancilla to the Pre-Socratic Philosophers*, Cambridge, Massachusetts (1957).

Gottschalk, H.B. "Soul as *Harmonia*", *Phronesis* 16 (1971): 179-98.

Gouk, Penelope "The Harmonic Roots of Newtonian Science" in *Let Newton Be!* (eds. John Fauvel, Raymond Flood, Michael Shortland and Robin Wilson), Oxford (1988).

Graves, Robert *The Greek Myths*, Volume II, Penguin (1960).

Grube, G.M.A. *Plato, Five Dialogues: Euthyphro, Apology, Crito, Meno, Phaedo*, Indianapolis (1981).

Grube, G.M.A. *Plato's Republic*, Indianapolis (1974).

Hamilton, Edith and Huntington Cairns, *The Collected Dialogues of Plato*, Princeton (1961).

Huffman, Carl A. *Philolaus of Croton: Pythagorean and Presocratic*, Cambridge (1993).

Jones, W.H.S. (trans.) *Hippocrates I*, Loeb Classical Library, Cambridge, Massachusetts (1923).

Jones, W.H.S. (trans.) *Hippocrates II*, Loeb Classical Library, Cambridge, Massachusetts (1923).

Jones, W.H.S. (trans.) *Hippocrates IV*, Loeb Classical Library, Cambridge, Massachusetts (1931).

Jones, W.H.S. (trans.) *The Medical Writings of Anonymous Londinensis*, Cambridge (1947).

Jones, W.H.S. (trans.) *Pausanias: Description of Greece III*, Loeb Classical Library, London (1933).

Jones, W.H.S. (trans.) *Pausanius: Description of Greece IV*, Loeb Classical Library, London (1935).

Kahn, Charles *The Art and Thought of Heraclitus*, Cambridge (1979).

Kirk, G.S., J.E. Raven, and M. Schofield *The Presocratic Philosophers*, Second Edition, Cambridge (1983).

Klibansky, Raymond, Erwin Panofsky and Fritz Saxl, *Saturn and Melancholy: Studies in the History of Natural Philosophy, Religion and Art*, London (1964).

Liddell and Scott *Greek-English Lexicon* (abridged), Oxford (1871).

Lippman, Edward A. *Musical Thought in Ancient Greece*, New York (1964).

Lloyd, G.E.R. *Polarity and Analogy: Two Types of Argumentation in Early Greek Thought*, Cambridge (1966).

Taylor, A.E. *A Commentary on Plato's Timaeus*, Oxford (1928).

Terzis, George "Homeostasis and the Mean in Aristotle's Ethics", *Aristotle, Virtue and the Mean, Apeiron* 25 (eds. Richard Bosley, Roger A. Shiner and Janet D. Sisson), Edmonton (1995): 175-89).

Thorp, John "Aristoxenus and the Ethnoethical Modes", *Harmonia Mundi: musica et filosofia nell'antitichita*, Biblioteca di Quaderni Urbinati di Cultura Classica 5 a cura di Robert W. Wallace e Bonnie MacLachlan, Edizioni dell'Ateneo, Roma (1991).

Tracy, Theodore *Physiological Theory and the Doctrine of the Mean in Plato and Aristotle*, The Hague (1969).

van der Warden, B.L. "Die Harmonielehre der Pythagoreer", in *Hermes* 78 (1943): 163-199.

Vlastos, Gregory "*Isonomia*" in *American Journal of Philology* 74 (1953): 337-66.

Wilson, John R. "*Kairos* as 'Due Measure'", in *Glotta* 58 (1980): 177-204.

Wilson, John R. "*Kairos* and the Aristotelian Mean", to be published in 1996 as part of the Proceedings of the *Kairos* Conference held in Aix, 1995.